

The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Degrees in Technical Chemistry

THE short notice we recently published as to the institution of technical chemistry courses in the University of Edinburgh is now amplified by an admirably clear account of the history, equipment, and general objects of the new Technical Chemistry Department of the University. The new chemistry buildings, the final portions of which are at present in course of erection, form the first group of "The King's Buildings," the foundation stone of which was laid by the King in 1919, erected on a site purchased for the accommodation of the ever-expanding scientific departments. In these the new chemistry department is housed. As regards the course of studies the arrangement is frankly provisional, and is open to modification and improvement as experience indicates to be advisable.

The idea of extending the field of study somewhat on the more practical side, without, of course, sacrificing fundamentals, is well described by our correspondent, "The science of chemistry," he writes, "as practised in industry must of necessity be carried out under strict commercial conditions, and it seems only just and right that students who are intending to practise chemistry in industry should have their eyes opened to the methods adopted for controlling costs, especially as in general their university practical chemistry has been carried out under quite artificial conditions as regards economy or wastage of material." Further, as

he points out, it seems reasonable that students who will ultimately be required to control industrial manufacturing processes and employ labour for the carrying out of these processes should be given an insight into the conditions of labour, employment, etc., under modern conditions. The course covers four years, and it is hoped to add the new subjects without sacrificing the efficiency of the old. The active co-operation of controllers of chemical industry in the district is being enlisted with a view to students getting into touch with industrial conditions as closely as possible.

The Edinburgh experiment will be watched with great interest from other educational centres, and the results are sure to be valuable to the contemplated efforts at extension in similar directions. If it succeeds it will not be the first case in which Scotland has set a sound precedent in educational ideals and methods.

Disinfecting with Hydrocyanic Acid

IN our issue for September 30 last we discussed the problems with which sanitation officials at the ports are confronted owing to the stringent quarantine regulations which are now enforced. It was then shown that so far as fumigation is concerned the standard methods employed until quite recently are proving impracticable in many cases owing to the elaborate nature of the furniture and fittings employed in the modern ocean-going vessel. We mentioned at the time that hydrocyanic acid gas had been experimented with in lieu of sulphur dioxide; but the efficacy of its use was rather overshadowed by the fact that it was responsible for a couple of deaths on the *Mauretania* in spite of the elaborate precautions taken. In the early stages of a new process, however, science frequently takes its toll, and the price paid for experience has invariably acted as an incentive rather than a deterrent. A good deal of interest was displayed at the time in the hydrocyanic acid method, and that its employment is likely to progress is shown by results which have recently been obtained with the process in India. In that country it is the railway carriage which, if unattended to, is responsible for carrying disease and vermin; and though many varieties of disinfectant treatment have been applied it would seem that none of them has yielded such satisfactory and positive results as a new method of hydrocyanic acid fumigation recently put into operation.

The system is the outcome of research carried out by Colonel Glen-Liston of the Bombay Bacteriological Laboratory, the method employed resembling in many respects that utilised in treating ships. In this case the hydrocyanic acid is generated from sulphuric acid and potassium cyanide, the gas being driven through piping by means of a fan into the closely sealed

carriages. Apparently, about 6 cubic ft. of the gas is pumped into each compartment, the latter being sealed all night and opened for ventilation in the morning, when all vermin is found to have been destroyed. The main advantage of this treatment is that the complete operation of disinfecting can be carried out in twenty-four hours, and the vehicles, clean and sterilised, returned to service. In no case so far has any untoward occurrence taken place, and the system seems likely to be put into general use in India. The necessity for generating the hydrocyanic acid on the spot is, of course, a disadvantage, for, as is well known, where it can be obtained a good deal of trouble may be saved by using the 98 per cent. product which has within recent years been put on the market.

French Views on British Trading Methods

To the many complaints against British exporters of indifferent attention to the local practices and conditions of markets abroad, the British Consul at Brest adds another. In the Brest district, he says, firms complain that British houses, in making quotations, do so only on f.o.b. terms, whereas their competitors quote in francs c.i.f. While it is realised that fluctuations in the rate of exchange are not helpful, it is felt that British firms should be prepared to take the same risks as their rivals in this respect. That catalogues and correspondence from United Kingdom business houses are invariably in the English language is another cause for dissatisfaction. The issue of catalogues and the conduct of correspondence in French is strongly recommended, as well as the quotation of prices in francs. The Consul adds that the advertisement of British goods in his district is sadly lacking, both in amount and in attractiveness. Progress has undoubtedly been made in these matters in recent years, but it is clear that our appreciation of the foreign buyer's convenience and point of view is still a little faulty.

In this contention an extract from a French correspondent (who points out incidentally that the foreign subscription rate of 26s. for THE CHEMICAL AGE comes to 94 francs at the present rate of exchange) may be worth quoting. "It is a great pity," he says, "that no arrangement can be made to settle this question of exchange. We in France would be most happy to buy British goods, for all of which preferential rates exist on our Customs tariffs, if we could only pay for them at some fixed rate. I used to import a certain quantity of English chemicals before 1914. Now all my trade is practically gone. I think the settlement of a fixed rate by creating a very large volume of trade between our two countries would greatly help to solve your terrible problem of unemployment. We are agriculturists; you manufacturers and merchants. We have enormous amounts of iron ore, but no coal; you have had this latter for centuries. I had the honour of serving all through the war with the 12th British Division as interpreter, and during the four years I was with them everybody seemed to be anxious for full co-operation after the war with us. Since then, unfortunately, we seem to be misunderstood, and are left to pay all the damages done by the enemy. Taxes, therefore, are four to five times more than before the war. Yet I still remember how the

lads looked with astonishment on the big sugar factories near Peronne scientifically destroyed by the enemy so as to make all repairs impossible. This was no shell fire damage, but wanton destruction *ab uno disce omnes*."

Evaporation of Stored Liquids

AN everyday problem with which many chemical engineers are faced is that of preventing or minimising the evaporation of stored liquids. No matter what precautions are taken, some loss is almost inevitable with certain liquids, although in many cases much of this might be avoided if less indifference were displayed in some establishments. A few years ago the late Mr. W. Curphey, chief inspector under the Alkali Act, went to some considerable pains to determine the best method of avoiding loss of volatile ammonia from stored ammoniacal liquor, and he eventually demonstrated that the most effective means was a surface layer of moderately heavy petroleum oil on the stored liquid. This is a method which has since been put into fairly common practice, and our readers will be interested to know that an adaptation of the process has recently been introduced in America for which many advantages are claimed.

In the new method the stored liquid, instead of carrying merely a layer of oil, is covered with a foam or foam-producing substance, which is intended to float upon the surface in the storage vessel. The foams are permanent in character; that is, they do not break down for some considerable period. They retain their fluent condition during their entire life, or they may be of such a nature as to congeal or solidify at ordinary atmospheric temperatures. Apparently the liquid base for the preparation of the foam may contain from 5 to 15 per cent. of water, from 3 to 10 per cent. of glue, and from 5 to 15 per cent. of starch, while glucose (or an equivalent material such as molasses) and glycerine are incorporated in the material. In addition, there is added a small quantity of calcium chloride for the purpose of increasing tensile strength at low temperatures, while the foaming agent employed is the sodium salt of sulphonic acids obtained from mineral oil sludge. The recipe is of a somewhat involved nature, but, as compared with the simple oil-film method, the principle of utilising a foam has the advantage of being independent of the gravity of the stored liquids. Thus, the new method is capable of application in the case of low gravity liquids where an oil film would be impracticable.

Production of Insulin

WORKING under licence from the Medical Research Council, in whom are vested all patent rights for this country, the British Drug Houses, Ltd., in conjunction with Allen and Hanburys, Ltd., working at high pressure, have, we understand, in a short space of time overcome technical difficulties of no mean order, and have succeeded in producing Insulin on a manufacturing scale. The first British supplies, therefore, are now available, and some thousands of doses have already been produced. Production is increasing week by week, but owing to the enormous demand anticipated, it is likely that the quantity available at

present will not suffice to meet all requirements, and therefore preference will be given in supplying hospitals and medical men possessing facilities for pathological testing. Early supplies are being made chiefly through the larger hospitals. The distribution of Insulin is subject to the direction of the Medical Research Council, a condition of affairs which is temporary and is expected to be of short duration. Special buildings have been erected and special plant installed for the purpose of this manufacture at the Wharf Road factory of the British Drug Houses, Ltd., where the work of extracting, isolating, and purifying Insulin itself has been carried out. The preparation, from Insulin-substance, and packing of the sterile solution of Insulin as actually used for injection has been carried out at the Bethnal Green laboratories of Allen and Hanburys, Ltd. The Insulin is issued under the joint names of the two firms as "A.B." brand.

"Chemist" and "Pharmacist"

FOLLOWING up Mr. Chaston Chapman's recent letter on this subject, Dr. E. F. Armstrong, in a communication on another page, suggests a practical first step towards getting rid of the present confusion of terms and meanings. His suggestion is that a round table conference should be convened of the leading organisations connected with chemistry and pharmacy, and that some agreed policy should be decided on and steps taken through the Press and in other ways to secure the right use of the two terms. There would probably be no serious difficulty among such bodies in arriving at an agreement which, without any loss of dignity on either side, would indicate that "pharmacist" means one thing and "chemist" another. The real difficulty would be in correcting the popular and well established, though incorrect, usage. In nine cases out of ten the person who desires a potion or an ointment thinks of a "chemist," and in the Press the habit is just as common. It must, therefore, be recognised that the task of getting the public to think in new and more exact terms will be difficult and prolonged. But the existing practice is bound to yield to persistent attack, and the sooner the attack begins on a definite plan the sooner will the reform be effected. Dr. Armstrong's suggestion strikes us as admirably sound and practical, and we can imagine no objection to its prompt adoption.

The Alkali Centenary

THE centenary of the alkali industry of Great Britain, which is to be celebrated next week by the United Alkali Co., Ltd., promises to be an occasion of historical interest, and the company's arrangements, as one might expect, are worthy of the occasion. An illustrated brochure is being prepared which will give a general survey—personal, scientific, and technological—of the foundation of the British alkali industry and of the steps by which it has reached its present pre-eminent position. On Wednesday evening next, at the Midland Adelphi Hotel, Liverpool, the chairman and directors of the United Alkali Co. will entertain a large and representative company to dinner. The celebrations will be continued over the three days from the 19th to the 21st inst. in the

form of daily visits to the company's works at Widnes in the morning, followed by luncheon at the Adelphi Hotel. Those taking part will include the leading representatives of British chemical industry, and some speeches of more than usual importance and interest may be expected.

Points from Our News Pages

- Mr. A. R. Pankard discusses, in the first of two articles, "The influence of science on human life" (p. 390).
An authoritative account is published of the history, equipment and objects of the new Technical Chemistry Department of Edinburgh University (p. 392).
The Corrosion of Metals and Alloys was discussed at a joint conference held at Sheffield University on Friday (p. 394).
Reports are published of the meetings of the Manchester and London Sections of the Society of Chemical Research (p. 396).
Abstracts of papers published include "Pulverised Fuel" (Dr. Dunn), "Pigments in Rubber" (Dr. Twiss), "Physics and Sewage Disposal" (F. R. O. Shaughnessy), and others (p. 397).
Business is stated in our London Market Report to be steadily recovering from the effects of the recent holidays, and the volume of trade passing to be increasing (p. 407).

Books Received

- INK. By C. Ainsworth Mitchell. London: Sir Isaac Pitman and Sons, Ltd. Pp. 128. 3s.
FILTRATION. By C. L. Bryden and G. D. Dickey. Easton, P.A.: The Chemical Publishing Co. Pp. 375. \$5.50.
WAVELENGTH TABLES FOR SPECTRUM ANALYSIS. By F. Twyman. London: Adam Hilger, Ltd. Pp. 106. 7s. 6d.
MERCURY ORES. By E. Halse. London: John Murray. Pp. 100. 5s.

The Calendar

April 16	The Chemical Industry Club: Meeting, 8 p.m.	2, Whitehall Court, S.W.1.
16	Society of Chemical Industry (Yorkshire Section): "Some Notes on the Production of Alkali by Bacteria as Registered by Different Indicators." J. A. Reddie.	Queen's Hotel, Leeds.
18	Society of Glass Technology: Annual general meeting.	Sheffield.
18	United Alkali Co., Ltd.: Centenary dinner.	Midland Adelphi Hotel, Liverpool.
19	The Chemical Society: Ordinary scientific meeting, 8 p.m.	Burlington House, London, W.1.
20	Society of Chemical Industry (Newcastle Section), Institute of Chemistry (Newcastle Section) and Newcastle Chemical Industry Club: Joint annual dinner, 7.30 p.m.	Royal Turk's Head Hotel, Grey Street, Newcastle.
20	Society of Dyers and Colourists (Manchester Section): "Mechanism of Diazo-Coupling Reactions," by Dr. T. K. Walker; "Evolution of Bleaching," by S. H. Higgins, 7 p.m.	36, George Street, Manchester.
24	Hull Chemical and Engineering Society: Annual general meeting, 7.30 p.m.	Hull Photographic Society's Rooms, Grey St., Hull.
26	Society of Dyers and Colourists: "Far Dyeing." L. G. Lawrie, 7 p.m.	Dyers' Hall, Dowgate Hill, London, E.C.

The Influence of Science on Human Life.—I.

By Arnold Rowsby Tánkard, F.I.C.

We publish below the first of two articles by Mr. A. R. Tankard, public analyst to the City of Hull, on the influence of science on human life. The concluding article will appear in our next issue.

IN spite of the re-awakened interest in certain forms of scientific activity all over the world, there unfortunately exists in some quarters real antagonism to science and its aims. Men of science feel, however, that this antagonism is based on misconceptions and misunderstandings; and it is the purpose of this short treatment of an important subject to re-state the aims and some of the outstanding discoveries of modern science and to rouse the rank and file of scientific workers themselves to enthusiasm for their science—indeed, to remind the reader what a goodly heritage we have in the stream of discovery of the last two or three generations.

In considering the influence of science on human life, I do not minimise the influence of other pursuits, and particularly of the arts, on our common existence. Thus literature, music, painting and other arts of culture of all kinds have variously affected our common humanity to a considerable extent during the generations—but the writer here submits that it is science, rather than the arts, that has had the supreme influence on the human race during the generations that have known our modern civilisation.

The reason for this influence is not surprising, nor far to seek. Science—of all the fields of human thought and endeavour—deals with Nature, and it is true to say that man is eternally warring against Nature, frustrating her inroads, worming out her secrets and wresting from her the hidden powers she possesses and turning them to his own uses. To what can man turn for aid in these things? To the natural sciences—to chemistry and physics, with the help of mathematics; to astronomy and geology; to botany, biology and zoology; and to their applications in engineering. These are our aids in the eternal fight of humanity against the great forces of Nature.

The detractors of natural science and its followers sneeringly decry the great discoveries made and the vast progress everywhere apparent in their wake, and they proclaim from the housetops that science is a materialistic god whose votaries are soulless, devoid of human feeling and sentiment and the enemies of man's true progress on the highest plane. But these blind critics are as shallow as their denunciations. What they fail to see is that in scientific method there is not, nor can there ever be, room for anything but cold, hard facts. It is true that our scientific philosophers are allowed to give reins to their imagination; and these philosophers indeed bid the workers investigating the laws of Nature to follow in their researches the unexplored but visualised regions of the philosophers' dreams. But in the practice of the scientific method itself it is with law and fact, experiment, observation and inference only that we can deal. The early workers in science, the astrologers, alchemists and the like, made their greatest blunders by their incurable habit of dreaming without any substantial foundation on which to establish their dreams or imagined "castles in the air." That way madness and error lie. To-day we have science organised, regulated and systematised, and theorising follows experiment and observation, instead of preceding them.

Modern Conceptions

When, however, the scientist has made his observations, rightly founded on experiments, he begins to infer from these the inner meaning of his work, and here he approaches the domain of the philosopher. But it is strikingly true, borne out by all experience, that this part of a scientist's legitimate work is at least as important as that which we have laid down as essential for a right foundation. Here, then, we see the complete scientist—one who is not soulless and dealing with hard concrete facts and laws only but who on occasion soars into the higher planes of thought as surely as any poet ever did, and with far more advantage to the world at large; for it were better to have conceived in the true scientific spirit a grand, lofty generalisation, such as that of the Periodic

Law of Newlands, than to have penned the most intimate touching ode to one's mistress's eyebrows!

Men of science are rightly proud of this progress which has been so rapidly made during the last hundred years. We are now beginning to understand, from afar off though it may be, the whole cosmos as a unity—to believe in continuity in the universe as a cardinal principle. And from the conception of this cardinal principle, the worlds—our own little planet and other far mightier worlds of this universe that we can to some extent now dimly visualise—are seen to be related and alike, related in constitution and alike in origin, bound together to some as yet unknown destiny. All in Nature is one, and arose from one cause. Men have speculated for many centuries on the origin of the earth and of the sun and the planets of our solar system and of other systems in the universe. When the era of pure speculation had given way to the scientific period of accurate observation by experiment, real progress in knowledge began, and this was mainly due to the perfection of the necessary instruments required for such work. Here chemistry, physics, mathematics and engineering—chief, perhaps, amongst the sciences—played notable parts, and we have gradually attained to something like perfection in the making of the modern telescope and the spectroscope, and in the use by the aid of photography of sensitised surfaces on which permanent records can be made.

Through the use of these instruments man has been enabled to notify many epoch-marking discoveries which are of the highest importance. Thus, for instance, by means of the analysis of spectra, the chemical composition of the stars has in large measure been determined; the direction and the rate of their movements have become accurately known; their temperatures and relative ages have been calculated; the existence of binary systems of light and dark stars has been proved, and other valuable data have been accumulated which Comte, the philosopher, singled out two or three generations ago for special mention as knowledge to which we should never be able to attain. It is thus dangerous to prophesy where science is concerned. We should do well to remember Darwin's words: "It is those who know little . . . who so positively assert that this or the other problem will never be solved by science."

The discoveries made in connection with the composition and movements of the stars are reflected in the following lines, written by a person with obvious scientific knowledge and some powers of versification:—

"Distant, scintillating star,
Shall I tell you what you are?
Nay, for I can merely know
What you were some years ago!

For the rays that reach me here
May have left your photosphere
Ere the fight of Waterloo—
Ere the pterodactyl flew!

There—your spectrum now is spread
Down from ultra-blue to red;
Crossed by dark metallic lines,
Of your cooler layer the signs.

Ah! your sodium line is seen
Strongly shifted towards the green;
Hence you are approaching me
With a high velocity!"

What are we to deduce, then, from these truly astounding discoveries of astronomical observation, spectrum analysis and photographic record as to the origin of our solar system and of the other systems constituting the universe? We may

confidently state that the argument for their common origin is a sound one. The same elements have been found in many of the stars and in our own sun as are found on the earth; indeed, in at least one notable instance—namely, that of helium—it was an observation of the presence of an apparently new element in the sun (by Lockyer) that led to its being given a name, and to a hope being expressed that some day this element might be found on this planet, as indeed it was some twenty-seven years later. The hottest and youngest stars show fewer undissociated elements in their spectra, while the cooler and older stars, like our sun, in which the elements have condensed, contain a larger number of recognisable elements. Thus our so-called chemical elements are not immutable, and we know this superlatively from the great work, initiated by a woman, which has now resulted in our knowledge of radium and other radio-active elements. The evolution of the elements was in most cases completed long ago, either by condensation of the lighter elements into the heavier or the converse of this process; while in radium and its allies we see elements which have "lagged behind" and have not yet completed their evolutionary change.

The Problem of the Atom

Directly as a result of all this later knowledge of the constitution of matter, as seen from the transmutation of elements of the uranium-radium group, we are accumulating an important mass of evidence, which will eventually enable us to solve the ultimate constitution of matter itself. The atomic theory still holds a worthy place—though perhaps not exactly the same place as when first propounded by Dalton and accepted by chemists. But its value is seen from the fruitful discoveries which have directly resulted from the theory, and which, like a life-giving stream, have been pouring out new meanings over the whole realm of chemical facts since the enunciation of this remarkable generalisation. The atom of the elements, though now no longer looked upon as the smallest unit and indivisible, does represent a unit of great stability in most cases—a unit held together by far mightier forces than any engineer has power over, and which defies, except to a minute degree, any successful attack upon it. The newer knowledge of the structure of this unit or atom has taught us that the atoms of the different elements have the same general type of structure, and that at the centre of the atom is a positively-charged nucleus of minute dimensions (in heavy atoms not more than 1-5000th of the diameter of the whole atom, and in lighter atoms even less than this fraction). In this nucleus the greater part of the mass of the atom resides. This nucleus is surrounded by a number of electrons (held in equilibrium by the nucleus forces), as the planets surround the sun in our solar system. By the action of light and electrical discharges, we can remove one or more of the external planetary electrons from the atom, while by the action of other fast-moving rays we can even detach one of the more strongly-bound electrons of the atomic structure. In a general view, we now believe that the complex nuclei of all atoms are built up of hydrogen- and helium-nuclei and electrons, while the helium-nucleus itself is composed of 4 H-nuclei and 2 electrons. Thus probably the nuclei of all atoms are composed of H-nuclei or "protons," with the addition of negatively-charged electrons. As a proof of these remarkable assertions, nitrogen, fluorine, phosphorus and aluminium have been bombarded with the X-rays from one of the radium-group of elements, and have yielded hydrogen atoms, liberated from the nuclei of these elements. It is probable that the H-nuclei are satellites of the main nuclei of these elements. Nitrogen itself, at least, has been split up into helium and hydrogen, which shows this element to be composed of 3 nuclei of He of mass 4 and 2 H-nuclei, accounting for its atomic weight of 14.*

By means of X-ray spectra, notably from Bragg's work, we are also beginning to get an insight into molecular structure. This field will undoubtedly be prolific in results, and the lattice-work structure and configurations of compounds of the benzene type may be expected to yield important evidence as to the true structure of the "benzene-ring."

* This account of the structure of the atom is mainly taken from Sir E. Rutherford's lecture on "Artificial Disintegration of the Elements" (*Trans. Chem. Soc.*, 1922, p. 400). A more detailed treatment of this interesting subject will be found in Dr. S. Miall's pamphlet: "The Structure of the Atom" (Benn Brothers, Ltd.).

The Title "Chemist"

To the Editor of THE CHEMICAL AGE.

SIR,—It would appear desirable to support the plea recently so admirably stated by Mr. Chaston Chapman, the President of the Institute of Chemistry, in your columns for the restriction of the word "chemist" to those who practise chemistry in the full sense of the word. Surely the time has arrived when we can come to an amicable agreement with our friends the pharmacists on this point, and I venture to suggest that much would be gained if it were possible to hold a round table conference officially representative on the one side of the Pharmaceutical Society, the retail Pharmacists' Union, and any other bodies concerned, and on the other side, of the leading chemical societies.

The object of such a conference would be to discuss the possibility of agreeing as a point of professional etiquette to the limitation of the terms "pharmacist" and "chemist," in the sense defined by Mr. Chapman.

If this could be achieved the rest would follow, and, with the support of the Press, the public would soon learn the proper meaning of the terms.—Yours etc.,

E. FRANKLAND ARMSTRONG, F.R.S.
President of the Society of Chemical Industry;

Trade Names and Chemical Formulæ

SIR.—Some emendation of Mr. Brown's list under this heading in your current issue is desirable. "Chrome Green" often denotes a combination of Prussian blue with lead chromate, especially the qualities free from barytes or other loading often known as "Pure Brunswick Greens." The term "Brunswick Green," also, is likely to give rise to confusion, more especially as the literal equivalent in French means a copper colour; this mistake of literal translation occurred in a printed version of the French tariff some years ago.

"Antimony Vermillion."—Generally an oxy-sulphide.

"Derby Red."—The deep shades of orange chrome are more usefully known as "Chinese" or "Persian" reds, thus avoiding confusion with the iron oxide pigment associated with that town.

"Prussian Blue."—The better qualities normally contain potassium and the ferri-cyanide radicle; this is missed in an analysis by boiling with alkali solutions since the equivalent ferrous salt, or hydrate, is oxidised and the ferri- reduced to ferro-cyanide. Is there any evidence that any useful Prussian blue pigment contains no ferri-cyanide?—Yours, etc.,

E. F. MORRIS.

4, Albert Square, Manchester,
April 9, 1923.

Industrial Oxygen

To the Editor of THE CHEMICAL AGE.

SIR,—I wish to correct your statement in the leader of last week on the above subject. This research, which has been carried out by Mr. Finlayson on behalf of the Woodall-Duckham Companies, has been handed by the latter to the Institution of Chemical Engineers. The work, which has been in my hands for several months past, is to form the subject of discussion at the first annual meeting of the Institution to be held in June next. It is hoped that the volume in its preliminary form will be in the hands of the members of the Institution in the course of the next few weeks.—I am, etc.,

J. W. HINCHLEY, Hon. Secretary.
The Institution of Chemical Engineers.

166, Piccadilly, W.1.

April 6, 1923.

[It was explained last week that the body to which this research data had been handed over was the Institution of Chemical Engineers and not the Society of Chemical Industry, as originally stated.—ED. C.A.]

Fire in Fertiliser Works

A FIRE occurred in the fertiliser works of Daniel Wyllie and Co., near Ayr, on March 26. The damage, which was considerable, included the loss of much ground manure through contamination with water, and owing to the pressure of business the firm has had to cancel some of its orders.

Technical Chemistry in Edinburgh University

Equipment and Objects of the New Department

By the courtesy of the Edinburgh University authorities, we are able to publish the following interesting account of the history, equipment, and general objects of the new Technical Chemistry Department of the University. The suggested course, it is pointed out, is frankly provisional, and is open to any modification and improvements which experience may suggest.

THE Technical Chemistry Department of Edinburgh University crystallised to definite form as a result of the impressive evidence of the war years, illustrating the vital need for continued and extended scientific control in our chemical industries and in other industries where chemical reactions are carried out on the large scale.

During the war, Sir James Walker and his co-workers, first at the Lothian Chemical Co.'s works and later at H.M. Factory, Craigmyle, carried out highly important national work in the manufacture of high explosives. The experience gained in this connection strengthened Professor Walker's convictions regarding the national importance of strong schools of chemistry in our universities, and led directly to an extension of the scope of existing training facilities by the institution of the Edinburgh University Technical Chemistry Department, although no definite call for such a department at that time existed either from students or from manufacturers.

With the advent of peace, steps were taken to form a department in technical chemistry at the University, and Dr. A. C. Cumming of the University Chemical Department, who during the war acted in an advisory capacity in the Factories Branch of the Department of Explosives Supply and had a large share in initiating and carrying on explosives manufacture in Edinburgh, was appointed first lecturer. At this time there was no accommodation for the new department in the existing chemistry buildings, and a room was hired from the Lothian Chemical Co. for conversion into a temporary laboratory. Meanwhile rapid progress was being made with the new buildings designed by Sir James Walker to house the Chemistry Department, which had long outgrown its old home, and accommodation was offered for technical chemistry to Dr. Cumming's successor, Mr. Allin Cottrell, M.Sc., formerly acids manager at H.M. Factory, Gretna, at the south-east corner of these buildings.

The New Chemistry Buildings

In order to give a clear idea of the Technical Chemistry Department it will be advisable first to survey briefly the new chemistry buildings, the foundation stone of which was laid by the King in 1919. The chemistry buildings, the final portions of which are at present in course of erection, form the first group of "The King's Buildings," erected at Liberton on a site of 115 acres of agricultural land recently purchased by the University for the accommodation of the ever-expanding scientific departments. The frontage of the chemistry buildings faces north, is of two storeys, and contains physical chemistry laboratories, a library where is housed the collection of books bequeathed to the University by the late Crum Brown, professors' rooms, common rooms, and administrative offices. The remainder of the building is mainly of one storey, and an excellent feature is that the whole stretch of floor is on one level, no steps being used at any point. The main laboratories are built on the factory shed plan of having saw tooth roofs with north window lights. These laboratories are flanked east and west by corridors giving access to east and west wings of research rooms, balance rooms, etc., which run the whole length of the building and serve architecturally to hide the unpicturesque, if business-like, appearance of the main laboratories. In addition to the large laboratories and stores, the main body of the building contains two large and two small lecture rooms with service rooms and museum. The lecture rooms are lit by lantern roofs, and by the use of a movable ceiling in the lantern it is possible by the touch of a button to set in motion mechanism for lowering or raising the ceiling in order to shut out daylight from the rooms for lantern projection purposes. The lecture rooms are adequately ventilated by an exhaust system.

There are four main laboratories, and owing to the system of roof lighting adopted it is not possible to find a dark corner anywhere. Even in winter there is little call for artificial

light. Adequate ventilation is ensured by the provision of a ventilating fan near the roof of each laboratory, and in addition an open suction duct is provided at each student's work bench, all the ducts being connected by earthenware pipe flues to exhaust fans of ample capacity. All the flanking research rooms, balance rooms, etc., are lit by large windows occupying practically the whole of the outside wall.

Laboratory Design and Equipment

The Technical Chemistry Department consists of three larger and two smaller laboratories with a workshop, and has the advantage of such necessary accommodation as lecture rooms, stores, balance rooms, etc., provided in the general scheme. Along the back wall of the technical laboratories, at a height of 14 ft., runs a large capacity uralite fume duct. Sliding doors are provided in the duct at intervals, and large volumes of gases can be moved along the duct by means of an exhaust fan discharging to atmosphere. A by-pass connection in the fan house enables the exhaustion of the fume duct to be effected alternatively by a Campbell ejector with the aid of a Sirocco high-pressure fan. Normal ventilation of the laboratories is effected by opening windows in the roof. Each technical laboratory has service pipes supplying cold water, hot water, gas, compressed air, steam and vacuum running round the walls at a mean height of 4 ft. 6 in., with taps at frequent intervals and occasional plugged T junctions for additional connections when desired. In addition, wall plug connections are provided for electric light and electric power, so that each potential working place is provided with on-the-spot connections to electric light, electric power, cold water, hot water, gas, compressed air, steam and vacuum. One laboratory has a chimney into which are connected sheet iron flues, provided with dampers, into which the products of combustion from furnaces can be led as desired. Each large laboratory has some elevated platform provision, this extending in one room to three platforms, one above the other, connected by fixed ladder steps.

The floors are of concrete, sloping to centrally situated grid-covered drains. Other drains are provided near the walls and in conjunction with large bore water taps provided at a convenient height for bucket filling purposes. Apart from ample shelving and cupboard accommodation in each laboratory the floors are not taken up by any fixtures, it being intended that handy tables of various heights will be available for use as found necessary. With the object of retaining as complete flexibility as possible, shafting has not been provided in any of the rooms. Power driven plants units will be operated by their own motors.

One of the small laboratories is designed on the same lines as the larger ones, but the second one has more the appearance of an orthodox chemical laboratory. In this room, however, although the general gas, water, sink, etc., connections are permanent, the working benches take the form of small handy open tables which can be moved about to suit the particular work in hand. The boiler installation for heating the chemistry buildings, comprising a 30 ft. by 8 ft. Lancashire boiler, is available for the study of fuel combustion.

Studies in Technical Chemistry

As regards the course of studies to be pursued for graduation in technical chemistry, there is no contention that the last word has been said on the matter in the proposed scheme briefly outlined in THE CHEMICAL AGE of March 17. The suggested course is frankly provisional and is open to modification and improvement as experience indicates to be advisable.

There is much diversity of opinion among chemists as to the need for a broader university training for the technical chemist than is provided in the schools of pure chemistry, with their courses of chemistry, physics and mathematics. Many contend that if a student is well trained in chemistry, and in addition, gets thorough grounding in mathematics and the principles of physics, he is adequately fitted to launch out into

the world after graduation and will "find his feet" in a very short time in whatever sphere of life he chooses for the exercise of his chemical knowledge. On the other hand, there are many who realise the possibility of removing unnecessary disabilities under which many students from schools of pure chemistry labour for short or long periods of probation when they are thrown in charge of large scale industrial processes.

There is common agreement that mathematics and physics must be studied by chemistry students, as these subjects are highly important working tools in the building up of the complex science of chemistry. It is not a big step to consider a study of the fundamentals of engineering practice as an extension of the study of physics with a bias towards many realities of the every-day world of industry. Again, the science of chemistry as practised in industry must of necessity be carried on under strict commercial conditions, and it seems only just and right that students who are intending to practise chemistry in industry should have their eyes opened to the methods adopted for controlling costs, especially as in general their university practical chemistry has been carried out under quite artificial conditions as regards economy or wastage of material. Further, it seems reasonable that students who will ultimately be required to control industrial manufacturing processes and employ labour for the carrying out of these processes should be given an insight into the highly complex and difficult conditions of labour, employment, etc., under modern conditions.

To put the matter briefly, the Edinburgh University Technical Chemistry course consists of a sound training in chemistry with the use of an extended range of "working tools," so that as far as possible students may learn chemistry "in a works atmosphere." It is hoped to enlist the active co-operation of controllers of chemical industry in the district with a view to students getting into real touch with industrial conditions as closely as possible.

A Four Years' Course

It is often contended that the normal pure chemistry training period for B.Sc. is quite short enough at present and that there is no time in a four years' course for the introduction of so-called extraneous subjects. Until recently the normal B.Sc. course was covered in three years; now it is extended to four. Even with the so-called extraneous subjects introduced into the four years' course, it should therefore be possible to give the same training in chemistry as was given until quite recently and which was received by thousands of chemists now practising. There is a limit to the extension of the training period, particularly from the standpoint of students who in this commercial age find it necessary to obtain salary producing employment at the earliest opportunity. A four years' course would seem to be the normal limit at present.

The German Dye Position

DR. CARL DUISBERG, director of the Leverkusen Dye Works, is reported to have said recently that they have sufficient stocks on hand to meet market demands for six months at least. The situation in the chemical industry at present was completely different in the various districts. Ludwigshafen already lay idle, and the other works had no great supplies of fuel. For the present they would not get new coal in sufficient quantities since they refused to pay taxes demanded by the French. The workmen would continue to be employed at other labours in case production was brought to a standstill.

The Badische aniline and soda factory was facing this condition, as well as the Oppau works. Hoechst already was working with heavy curtailments. In Elberfeld, the parental plant of the Leverkusen works, the circumstances were even more difficult.

The works in Leverkusen itself, which lay in part in the English zone, were not so severely stricken by the Ruhr war, and favourable conditions still prevailed. They had chiefly lignite coal, obtained in the English zone itself. The dye industry was well supplied with stocks, and in case of necessity one source of supply could help another out and during the French boycott on exports the workmen would be engaged in handling the stocks on hand and keeping the plants in operating order.

Society of Public Analysts

At an ordinary meeting held at the Chemical Society's Rooms, London, on Wednesday, April 4, Mr. P. A. Ellis Richards, president, in the chair, certificates were read for the first time in favour of Mr. R. C. Grimwood, A.C.G.F.C., D.I.C., A.I.C., and for the second time in favour of Messrs. J. Myers, F.I.C., and J. L. Buchanan, F.I.C..

The following were elected members:—Messrs. J. J. V. Backes, A.R.C.Sc., A.I.C., D.I.C.; F. K. Donovan, B.Sc. (Lond.); A. E. Johnson, B.Sc. (Lond.), F.I.C., A.R.C.S.I.; E. V. Jones, F.I.C.; S. G. Liversedge, F.I.C.; S. G. Stevenson, A.I.C.; R. W. Sutton, B.Sc.Tech. (Manc.), A.I.C. and L. B. Timmis, M.Sc. (Tech.) Manc., A.I.C.

Abstracts of Papers

In a paper on "Physiological Standardisation," Dr. Stanley White pointed out that since many important drugs used in medicine did not lend themselves to chemical standardisation, it was necessary to adopt physiological standards. A number of individual drugs, including digitalis, ergot and cannabis indica were dealt with, and a method described of arriving at the minimum lethal dose on frogs, and so establishing a heart tonic unit. The standardisation of pituitrin and physiological methods for determining the presence of the three vitamins were discussed.

Mr. G. W. Monier-Williams, M.A., Ph.D., F.I.C., in dealing with the "Estimation of Boric Acid in 'Liquid Eggs' and other foodstuffs," drew attention to the irregular results sometimes obtained with Thompson's method, owing to loss of boric acid by precipitation as calcium borate during the removal of phosphates. A method was described in which phosphoric acid was removed by precipitation as magnesium ammonium phosphate, the subsequent titration of the boric acid being carried out by Thompson's method.

A paper, "An Investigation into the Chemistry of the Reinsch Test for Arsenic and Antimony, and its extension to Bismuth," by B. S. Evans, M.B.E., M.C., B.Sc., F.I.C., supplied a summary of the literature relating to the reaction. A method was described for determining the velocity of the reaction, and a number of curves were given showing the influence on the reaction velocity of varying chloride, acid strength or arsenic (antimony, etc.), also the effect of adding cupric or cuprous salts. The products of the reaction were:—For arsenic, the compound Cu_3As_2 ; for bismuth, the element bismuth; for antimony, the compound Cu_2Sb , followed by deposition of the element antimony. In all cases cuprous chloride went into solution.

An attempt was made to elucidate the mechanism of the reaction, and a number of experiments were described leading to the conclusion that it was due to reduction of the arsenic (or antimony, etc.) by a film of hydrogen on the surface of the copper. Under certain given conditions the test used qualitatively could be made sensitive to less than 0.01 mgrm. per 100 cc. It was suggested that a determination of the reaction velocity carried out in any doubtful liquid would readily show whether any substance was present which would interfere with the test.

The Hafnium Controversy

IN the issue of *Nature* for April 7 there appear two further letters on the controversy arising out of the discovery of hafnium. The first is from Messrs. H. M. Hansen and S. Werner, the second from Messrs. D. Coster and G. Hevesy, all at the University at Copenhagen. They advance sound reasons based on the examination of the elements in question, both chemically and by means of their X-ray spectra, for concluding that their discovery of hafnium (atomic number 72) is quite distinct from Dr. Urbain's claim for celtium. Hafnium is related closely to zirconium, while Dr. Urbain's element is one of the rare earth series. Messrs. Hansen and Werner submit further that celtium is identical with an element discovered by Welsbach in 1905 and named cassiopeium by him, though this was also known to Urbain, who named it lutetium. The atomic number of this element is 71. The evidence is based on spectrum measurements, which is probably the most reliable criterion for rare earth elements since they are chemically so difficult to distinguish.

Joint Conference on Corrosion Problems

At a general discussion on "Resistance of Alloys to Corrosion" held jointly at Sheffield on Friday, by the Faraday Society, the Sheffield Section of the Institute of Metals, and the Manchester Metallurgical Society, the papers included those abstracts of which appear below.

"Dry Corrosion" of Metals

THE discussion on this subject was opened with a paper by Mr. Ulick R. Evans, who said that by the term "apparently-dry corrosion" he meant cases where a metal protected from rain was exposed to the air, and corrosion was slow owing to the deficiency of water. If moisture was absent altogether, metals were unaffected by air; but if an invisible film of water was present on the metal, a perceptible oxidation of the latter takes place in some cases; it is usually greatly accelerated if volatile electrolytes such as hydrogen chloride, sulphur dioxide or ammonia are present. The information available in chemical literature was somewhat scattered and fragmentary, and it was thought best to establish the important facts afresh by experiment.

In the main experiments the metals tested were in the form of thin sheet or foil, although in some of the subsidiary experiments other forms of the metal were introduced for comparison. Different samples of the same metal from different sources, varying greatly in purity, were used, but it may be stated at once that except in a few instances the general character of the corrosion did not appear to be affected greatly by the degree of purity. The greater number of experiments were carried out with "electrolytic copper," "pure zinc," "pure lead," and 70/30 brass obtained from Messrs. Griffin, and with Kahlbaum's "pure iron foil." Mr. C. T. Heycock very kindly provided various samples of aluminium, copper, brass, nickel, and tin. Numerous commercial or domestic forms of metals, mostly obtained locally, were used in some of the tests; these included commercial lead sheeting, bronze and silver coins, tin plate, knitting needles, safety razor blades, spring steel, iron bolts and nuts.

All the results recorded referred (unless otherwise stated) to specimens cleaned and roughened by rubbing with coarse emery-cloth, although in some of the subsidiary experiments samples carrying their natural "scale" were introduced for comparison. The roughened specimens had the advantage of presenting a large surface to the corrosive agency, and the interpretation of their behaviour was not rendered difficult by any doubts regarding the nature of the "Beilby film" which existed on the surface of polished metals. Acid pickling was not used except in the case of some of the iron samples. The size of specimens employed varied according to the question to be investigated; in the main experiments described in Part I. the copper, zinc, lead, and iron specimens were 2 in. square, but this proved to be unnecessarily large for the purpose; the specimens of the more valuable metals were smaller.

Many workers on corrosion had noticed that different samples of the same material, exposed under apparently similar conditions, did not behave, even qualitatively, in the same way. In the experiments described below, whenever any appreciable corrosion-phenomenon was noticed in a specimen of a metal exposed to any particular corrosive agency, a second specimen of the metal was exposed to the same agency in a separate vessel, to ascertain whether the behaviour could be reproduced. In only a very few cases (e.g. copper, aluminium, and iron in the presence of hydrogen chloride) was a lack of "reproducibility"—real or apparent—met with; in each of these cases, special experiments were undertaken to investigate the factors involved. Altogether 320 specimens were exposed during the research.

The Influence of Volatile Electrolytes

The main experiments were carried out in glass "desiccator-vessels" of the usual pattern, the solution containing the volatile electrolyte being placed in a small vessel at the bottom of the desiccator. In the main experiments, conducted in November and December, 1922, the vessels were kept in a fume cupboard, the temperature of which never rose above 16° C.; a smaller series of experiments had been conducted in June, 1921, and a comparison of the results showed that the phenomena at summer temperatures were similar to those at winter temperatures, although naturally the corrosion was rather more rapid. The main experiments conducted over sulphuric acid and water were continued for 27 days;

those over hydrogen chloride, sulphur dioxide, ammonia, hydrogen sulphide and carbon dioxide for 15 days; the duration of the numerous subsidiary experiments varied according to the point to be investigated. When the vessels were opened, a considerable decrease of pressure was noticed in the vessels containing ammonia and sulphur dioxide, due no doubt to absorption of oxygen, whilst an increased pressure was noticed in the vessel containing hydrochloric acid, which was ascribed to the liberation of hydrogen.

After exposure over concentrated sulphuric acid, specimens of copper, zinc, lead, tin, nickel, aluminium, and iron remained perfectly bright and unaffected after one month's exposure in a vessel containing sulphuric acid; a steel razor-blade retained its edge unblunted.

One month's exposure in a vessel containing water produced no serious change in any metal. The iron, however, showed tiny dots of brown rust on the surface. Several metals became slightly duller, the lead darkening considerably, whilst zinc acquired a yellowish grey or greenish grey colour; the change was only superficial. Copper scarcely altered, although it became slightly dull in places; tin, aluminium, and α -brass remained bright and unchanged.

With water saturated with carbon dioxide the phenomena were practically the same as over water, but the changes appeared more quickly. Iron developed tiny dots of rust within a few days, and some of these grew to small but conspicuous spots in two weeks.

Hydrogen Sulphide

Hydrogen sulphide caused a conspicuous alteration in the appearance of several metals, but the change did not penetrate below the surface. The Kahlbaum iron was most affected, becoming covered within two weeks with a very thin coating of rather loose dark-brown rust. Copper began to darken within a few minutes of its introduction, and in half an hour developed beautiful interference colours, being rose-purple, blue or steely-silver in different places. After a day it had turned greyish or bluish-black; even after two weeks the change was only superficial. Lead became dulled to a bluish-grey colour, but even after two weeks it retained something of a metallic lustre. Brass showed discoloration in places, a bluish-grey iridescence being produced; at other points the original yellow, slightly dulled, remained. Tin and aluminium were practically unchanged.

In all the experiments so far described, the metals remained "dry" in the ordinary sense of the word, but later, certain cases occurred in which (no doubt owing to the fact that the corrosion product was a deliquescent body) the metal, although dry when introduced, quickly became wet.

On exposure over concentrated ammonia (880), copper began to darken after a few hours; after a day the colour was black, and drops of deep violet-blue liquid had appeared on the surface. The production of this liquid increased as corrosion proceeded, and it soon began to flow off the copper into the lower part of the vessel. The blue liquid showed the tests for nitrites; this was not unexpected, since Bassett and Durrant* had shown that the main product of the corrosion of copper by aqueous ammonia in presence of air was the nitrite $[\text{Cu}(\text{NH}_2)_4](\text{NO}_2)_2$. After two weeks, the deposit on copper was greenish-black, but was quite thin; the metal below was unchanged and not brittle. Alloys containing copper, like coinage bronze and brass, also turned black and shed the violet-blue liquid. Brass was changed in mechanical properties also, some samples becoming so brittle after two weeks as to crumble in the fingers; this was probably a case of intergranular penetration, since the fracture showed the yellow colour of unchanged brass in the interior. The change shown by the other metals were quite superficial even after two weeks. Zinc developed some dark grey patches, but remained dry and practically unattacked. Lead turned a dull bluish-grey, with yellow or brown patches. Tin remained bright, dry and unchanged, and the same was true of aluminium, apart from a slightly frosted appearance on the surface.

* H. Bassett and R. G. Durrant, *Trans. Chem. Soc.*, (1922), 2630.

Iron and steel seemed to be unaffected by exposure to ammonia; a razor blade retained its edge unblunted after 8 days. This fact was of some interest since it was commonly believed that the rapid rusting of steelwork kept near stables was due to the ammonia from the manure; but it was more probably due to carbon dioxide. Many samples of nickel were almost unaffected by ammonia; some samples darkened considerably, and even shed a blue liquid, which was found, however to contain copper; copper, of course, being a common impurity in commercial nickel.

All the specimens of iron and steel exposed over water saturated with sulphur dioxide became dark within a few hours; after a day, they were nearly black, and were sufficiently moist to have produced a distinct brown "rust-stain" upon the filter-paper on which the specimens rested. After two weeks the articles were covered with a brown or black deposit, about 0.1 mm. thick, with local excrescences of wet yellow-brown ferric hydroxide; the deposit, which gave a cloudy solution in water but a clear solution in dilute acid, showed the reactions of sulphate and contained more ferrous iron than ferric. The corrosion was most serious; the metal composing the "edge" of a razor-blade was removed altogether. Nickel also became black, and after two days began to shed copiously a pale green liquid. Zinc became dull after a few hours, but continued to look "dry" (in the ordinary sense of the word) for some days, though after two weeks it was found to be covered with a moist pasty white deposit about 0.2 mm. thick, below which the zinc was unchanged. The "paste" dissolved in cold water, the solution containing much sulphate and some sulphite.

Effects on Various Metals

Zinc placed in a vessel containing hydrochloric acid became visibly damp within an hour, no doubt owing to the hygroscopic character of zinc chloride; the metal soon became very wet, and corrosion was very rapid. In the last stages, minute hydrogen bubbles were seen. Lead began to show iridescent interference colours (bronze, blue or pinkish in different places) within twenty minutes; afterwards the colour became dark grey, but the attack was only superficial even after two weeks. Tin likewise suffered a superficial attack only; the surface became greyish, but remained dry. Aluminium proved rather variable, and special experiments were performed. One sample of foil remained bright except in a few spots, whilst in another experiment a specimen of foil (surface roughened with emery) remained apparently unchanged—apart from a slightly frosty appearance—for two weeks. The thickness of the feathery chloride deposit was in some cases considerable; a wire of diameter less than 1 mm. became covered in 8 days with a growth extending outwards to a distance of 1 cm. Copper also showed a rather variable behaviour. Most specimens became only superficially attacked. Some specimens, however, became covered locally with a comparatively thick green deposit, mainly cupric chloride. α -Brass, of which six different samples were tested, differed from copper in becoming extremely "wet," no doubt owing to the deliquescent character of zinc chloride.

Iron behaved in a very interesting manner in the presence of hydrogen chloride, and numerous subsidiary experiments were performed with different kinds of iron and steel. Whenever the specimens studied were freshly rubbed with emery and free from rust or scale, they remained dry, but lost their lustre, acquiring a whitish-grey frosted appearance; when they were taken out and exposed to ordinary damp air (free from hydrogen chloride) water was absorbed, and the surface became covered with damp brownish rust, caused by the oxidation of ferrous chloride to ferric hydroxide. If, on the other hand, the articles had rusty patches when they were introduced, the rust quickly combined with hydrogen chloride, and the ferric chloride—being deliquescent—absorbed moisture; a damp patch thus appeared on the metal, which was yellow at first, but quickly lost its yellow colour owing to the reduction to ferrous chloride.

Cases of the corrosion of dissimilar metals in contact were also investigated, peculiar effects often being noticed at the junctions according to the nature of the corroding gases.

The Influence of Humidity

It was generally agreed that if a substance was placed in air that was not absolutely dry, a certain number of water molecules became attached to the surface; if the air was distinctly "unsaturated," the adsorbed film produced was probably of molecular thickness only. Experiments were carried out in unsaturated air containing volatile electrolytes, and showed definitely that corrosion could be initiated in unsaturated air. Zinc in hydrogen chloride was corroded actually more quickly at a constant temperature of 25° C. than in an exactly parallel experiment conducted at a fluctuating temperature (below 15° C.). Lead in hydrogen chloride quickly darkened; in a "compound piece," the lead remained bright along the line of contact with zinc, although dark elsewhere, thus showing electrochemical protection. Copper blackened in the presence of ammonia, but (in contrast with its behaviour in saturated air) did not shed any blue liquid.

Experiments in dried air containing volatile electrolytes showed that the presence of water was a vital factor in determining corrosion even when volatile acidic substances were present, but that slow superficial corrosion could occur in many cases when the moisture-content was very far below the saturation-value.

The phenomena were best explained if we considered that electrochemical action occurred in the adherent (usually invisible) film of moisture. Volatile electrolytes increased the conductivity of the film and thus accelerated corrosion. Where they tended to produce hygroscopic corrosion-products, they brought about the absorption of further moisture and thus increased the thickness of the film; in several cases (zinc in hydrogen chloride, copper in ammonia, nickel in sulphur dioxide) the metal, originally dry, soon began to shed liquid copiously, and in such cases corrosion was very serious.

The greater part of the experiments were carried out in the Goldsmith Laboratory of Metallurgy, Cambridge, and Mr. Evans wished to thank Mr. C. T. Heycock, F.R.S., both for his kindness in allowing him the facilities for carrying on the work, as well as for the provision of a variety of materials. The thermostat experiments were carried out in the Physical Chemical Laboratory, by kind permission of Professor T. M. Lowry, F.R.S.; he also wished to thank Mr. L. L. Bircumshaw for his help in connection with that portion of the work.

Monel Metal

Mr. John Arnott, A.I.C., dealt with the properties of the alloy known as monel metal, which might be said to be primarily an engineering material with excellent physical properties and good resistance to many corrosive agencies. Its sphere of use was therefore different from that of the truly acid-resisting metals, such as the iron-silicon alloys, which had to be employed in certain cases in spite of their poor mechanical properties.

With regard to atmospheric corrosion, monel metal was very little affected by exposure to fairly pure air. A sheet freely exposed to the elements at Cathcart was bright after five months and showed no change in weight. In air which was more impure, monel metal became discoloured, but the attack did not extend beyond the surface layers. The brown discoloration on each was easily removed by a fine abrasive.

The resistance of monel metal to sea water might be said to be practically absolute. Several valves which have been in actual sea water for over three years were as bright as when first immersed.

Monel metal was unaffected by wet, saturated or superheated steam. Valves working in steam at 750° F. for several years were only slightly dull on the surface and clearly showed the original tool marks.

Generally, monel metal was not suitable for use with strong acids, as in acid manufacture. It was readily soluble in concentrated nitric acid, and was attacked by strong hydrochloric and sulphuric acids, especially if the acids are impure. Monel metal is not affected by alkalis, however, and only to a slight extent by the majority of solutions of neutral salts at ordinary temperatures.

To sum up, monel metal was suitable for parts which had to resist (1) sea water, (2) impure water such as is found in many canals and in mines, (3) steam, (4) dilute acid solutions such as are used in many industrial operations, (5) alkaline solutions of all kinds.

Society of Chemical Industry

Membership Problem in Manchester

THE annual general meeting of the Manchester Section of the Society was held on Friday, April 6, Dr. E. Ardern, F.I.C., being in the chair. There were six nominations for membership on the Committee, and as there were only five vacancies an election was necessary. Messrs. Melling and Pettigrew were appointed scrutineers and, in the result, Messrs. J. Allan, C. J. T. Cronshaw, G. D. Elsdon, S. H. Higgins, F. G. Jackson, and F. S. Sinnatt were elected.

Mr. H. C. Clanagan was appointed auditor; as there had been no nomination received with respect to the appointment of the second auditor, the matter was left in the hands of the committee to deal with at a later date.

The honorary secretary of the Section (Mr. L. Guy Radcliffe) in the annual report stated that during the first two or three months of the session a special effort was made to increase the membership, but, so far as could be ascertained, the results were not too satisfactory. At present the total number on the Manchester register was about 550, and no fewer than 25 resignations from the Society and of members on the Manchester list became effective on December 31, 1922. The Hospitality Fund had been well supported, but by comparatively few members, from whom the actual amounts contributed had been far in excess of the 2s. 6d. which every member was invited to subscribe.

Abstracts of Papers

The ordinary general monthly meeting of the Section followed. Two papers were read by Dr. E. Ardern, the titles and authors being as follows: (1) "The Recovery of Nitrogen from Sewage by the Activated Sludge Process." By Edward Ardern, D.Sc., F.I.C., Clarence Jepson, M.Sc., A.I.C., and Percy Gaunt; (2) "The Activated Sludge Process, Withington Works," by Edward Ardern, D.Sc., F.I.C., and William T. Lockett, M.Sc.

In the first paper the authors stated the result of investigations carried out some three years ago, both in the laboratory and under large-scale working conditions, with the view of ascertaining what proportion of the total sewage nitrogen was recovered in the resultant sludge, when the sewage was treated by the activated sludge process. The question of possible losses of nitrogen and the source of the high nitrogen content of activated sludge was also dealt with. It was claimed that under favourable operative conditions, as much as 30 per cent. of the total sewage nitrogen might be recovered in the resultant sludge. The results described afford no evidence of the fixation of atmospheric nitrogen nor of the absorption and assimilation of ammoniacal salts. They indicated that the high nitrogen content of the sludge must be ascribed chiefly to the flocculation of the sewage colloids which were richer in nitrogen than the gross suspended solids.

The second paper gave a more or less detailed account of a prolonged study of the operation of the activated sludge plant at the Withington Works of the Manchester Corporation, designed with the view of ascertaining the various factors influencing the complete and successful control of the process. It was shown that as the result of information afforded by careful attention to the question of the character of the sludge in circulation and the dissolved oxygen content of the mixed liquor in the aeration chamber it had been possible to increase the maximum effective capacity of this plant by some 25 per cent. The summary of analytical returns for the past 15 months showed that entirely satisfactory purification was maintained throughout this period, with the production of effluents readily complying with the standard recommended by the Royal Commission on Sewage Disposal, and the table of operating costs indicated that with the new air-compressing plant which was shortly to replace the existing compressor, such results would be obtained at a very reasonable cost, especially having regard to the relatively low capital expenditure involved in the adoption of the process. In conclusion, the authors stated that an additional unit of some five or six times the capacity of the existing activated sludge plant was now under construction at these works.

Dr. Renshaw, and Messrs. Drummond Paton, Pettigrew, Race, and the chairman of the Philadelphia Chemical Society (Mr. Vail) took part in the discussion.

Papers before the London Section

At the meeting of the London Section of the Society of Chemical Industry at the Engineers Club, Coventry Street, on Monday, April 9, Mr. E. V. Evans, Chairman of the Section, presiding, two papers were read and discussed. The first was on "The Cod Liver Oil Industry of Newfoundland," the authors of which were Messrs. S. S. Zilva and J. C. Drummond.

Vitamin Content of Cod Liver Oil

Mr. Zilva said the authors had been engaged in the elaboration of a method for the estimation of the vitamin content of cod liver oil, it having been found that cod liver oil was about 250 times as potent as an average sample of butter. One of the problems in hand was to discover why substances like butter or animal tissues which also contained vitamin A were not as actively therapeutic as cod liver oil. It had been necessary to investigate both the method of manufacture and the conditions under which the manufacture of cod liver oil took place in Norway and in Newfoundland, these being the two most important places where cod liver oil was manufactured. He explained how in the case of the Norway industry the oil was not always pure cod liver oil, but was obtained from mixed catches of fish, whereas in the case of the Newfoundland industry all the fish was cod, and the oil was therefore pure cod liver oil. There were three main methods of producing cod liver oil. The first was the old rotting process—now seldom used—in which the livers were allowed to rot and the oil rose to the surface; the second was the jacketed method, which consisted of steaming the liver in jacketed apparatus until the oil rose to the surface; and the third method was the direct steam method, in which steam was blown into the liver, breaking up the tissue, the oil again rising to the surface. The last method was the one mainly employed in Newfoundland now.

For the purpose of making the tests of the vitamin potency rats were used, doses of 1.6 milligrams being given to the rats and their growth recorded. This had been found to be quite a reliable method. Testing samples of oil made by the jacketed process and the direct steam process in this way, it was found there was no difference in the vitamin potency, thus showing that the direct steam method was as good as the older method practised mainly by the Norwegians. It was found that the vitamin potency of the second fraction (not commonly used for medicinal purposes), was almost as good as that of the first fraction, and considering the hygienic conditions under which the oil was prepared it seemed a pity that this fraction should only be used for industrial purposes, because it would be quite good for medicinal or agricultural purposes, such as feeding cattle. It had also been proved that the fish varied anatomically according to the place where they were caught, but investigation showed that the oil produced from the livers of these various fish did not differ in vitamin potency. It had been found that the minimum dose of Newfoundland cod liver oil necessary to promote growth in rats was from 1.2 to 1.6 milligrams, and there was a great uniformity of potency in the Newfoundland fish. With the well-known Lofotens cod liver oil from Norway (which was from pure cod and not from mixed catches) the minimum dose was found to be 5 milligrams, and from the fish caught on the northern coasts of Norway there was a great variation in the potency owing to the fact that the catches were often very mixed.

Acetone Fermentation Process

The second paper dealt with the "Separation of the Gases formed in the n-Butyl-alcohol-Acetone Fermentation Process," and was by Mr. E. W. Blair, Mr. T. S. Wheeler, and Dr. J. Reilly. This gave an account of some preliminary experimental work carried out at the Holton Heath cordite factory and gave a description of a fractional solution method for the separation of hydrogen and carbon dioxide, the recovery of the gaseous products of the process in question not having, it was stated, received much attention hitherto. The authors stated that 100 parts of maize containing 65 per cent. of starch gave approximately 7 parts of acetone; 16.3 parts of n-butyl alcohol; 39 parts carbon dioxide, as gas; 0.1 part carbon dioxide in solution; 1.1 parts of hydrogen; and 1.2 parts of fatty acids. The method described in the

paper was a graphical one, the actual experimental apparatus having been constructed and operated, and the theory of the process being worked out subsequently and found to have a close agreement. For simplification of explanation, the case of hydrogen and carbon dioxide as obtained in the fermentation process was taken for consideration, but it was pointed out that it could be applied to other fractionation processes.

A number of points were raised in the discussion, which, however, Dr. Reilly said had not been gone into because the apparatus was a purely experimental one for a special purpose, and he did not think the process would ever be worked on a large scale in this country. It had its greatest application in tropical countries where large quantities of starchy material was available. In such circumstances he saw no reason why the process should not be worked economically.

The Use of Pulverised Fuel

Paper by Dr. Dunn

At a meeting of the North East Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne, on Friday, April 6, Dr. J. T. Dunn, F.I.C., read a paper on "Powdered Coal as a Fuel," Sir Charles Parsons presiding.

In opening the lecturer pointed out that in considering the combustion of coal, two points arose. The first was that coal was not entirely a combustible substance, but always contained mineral matter, which, on burning, was left in the form of ash. This ash was useless from the fuel point of view, and tended to prevent the burning of the combustible portion; and, further, the removal and disposal of the clinker demanded labour and became a large item of cost. For this reason many large coal deposits were useless, simply because the imperfection of the combustion and the troubles of dealing with the clinker made their use industrially unprofitable. The second point was that when coal was burnt in a furnace it did not burn away as a whole continuously, but gave off, as it heated up, large volumes of gaseous combustible matter, and left behind a solid residue of carbon or coke; and the supply of air for combustion had to be so regulated that it could deal with the gaseous as well as with the solid products. If the supply of air were short, much of the combustible matter went off as smoke, involving both loss and nuisance; and to ensure that this should not be the case, a considerable amount of surplus air had in practice to be supplied, involving waste through the heat which it carried away with it. Many mechanical stoking devices had been introduced to deal with this difficulty.

Both of these difficulties were very much lessened and many other advantages resulted if, instead of the coal being burnt on grates in the solid form, it was finely pulverised and injected into the furnace in the form of a stream of dust, mixed with the air which was necessary for its combustion. Continued experiment and inquiry into the conditions requisite for success led to such satisfactory results being obtained that to-day large numbers of installations existed using solely powdered coal—chiefly in various branches of the metallurgical industry, but also in the production of power by steam-raising. This was especially the case in the United States, and also in France. Much less progress seemed to have been made in this country, but installations were in use here, and the rapid increase in the use of powdered fuel abroad seemed a valid reason for drawing attention to it.

A typical installation for the burning of powdered coal included arrangements for (a) breaking, (b) drying, (c) pulverising the coal, (d) transporting it to the furnace, (e) feeding it through the burner. The systems in use divided themselves sharply into two: (1) The unit system, in which the coal was pulverised at the furnace, so that there was a separate pulveriser for each furnace; (2) the multiple system, in which the coal is pulverised at a centre and transported as a powder to any number of furnaces that might be included in the installation.

Types of Installation

He considered first a unit installation, typified by the aero-pulveriser of the Powdered Fuel Plant Co. He pointed out that the unit system was very compact, and was very useful where the installation was small and would not justify the capital outlay for a separate pulverising

installation and transport system; but the cost, of course, increased almost proportionately with the number of furnaces to be fed. Another advantage was that unless the raw coal were very wet it could be used in the pulveriser without preliminary drying, for there were no great lengths of piping, no bins nor feed-screws, and hence there was little likelihood of clogging of wet coal occurring. The turbo-pulveriser did not pulverise the coal so finely as some of the pulverisers in other systems (in one instance 70 per cent. passed a 200 inch sieve and 88 per cent. a 100 inch), but the fineness was sufficient to ensure practically complete combustion of any ordinary coal. Nearly all the air needed for the combustion of the coal was drawn in by the fan and mixed with the coal before it reaches the burner; and it was possible to secure smokeless combustion with a great variety of coals.

In the multiple systems the first step, as in the unit system, was the crushing of the coal. Before pulverisation the coal was in all these systems dried to such an extent as to leave not more than 0.5 to 1.0 per cent. of moisture in it. Not only was finer pulverisation secured by using dry coal, but the risk of stoppages, caused by the clogging of the powder and its sticking or hanging in the pipes, conveyors, valves, or storage bins, was very greatly lessened. Generally, the finer the grinding the more rapid could the combustion be made; but, of course, more power would be needed for the grinding. In some cases rapid combustion and a short, hot flame might be desired; but in others a slower and longer flame might be preferable, and in such cases probably rather less fine grinding might be sufficient.

For the transport of the powdered coal from the pulveriser to the furnace burner various methods were adopted, such as screw conveyors, or pneumatic methods in which the coal is made to flow through pipes by air pressure. The finely pulverised coal particles entrained, or "adsorbed" on their surfaces, a considerable amount of air (a given volume of pulverised coal contained only 46 per cent. of actual coal, and 54 per cent. of air by volume), and had almost the same freedom of flow as a liquid. He referred in detail to the Fuller-Kinyon, Quigley, and Holbeck systems, and remarked that each had its particular advantages and disadvantages.

At the burner the coal was mixed with the "primary air," usually injected into it from behind, which carried it along into the furnace. This mixture does not usually contain the full amount of air needed for complete combustion, and "secondary air" was introduced, sometimes by suction on the injector principle, sometimes from a separate blower. Usually this was introduced concentrically with the air and fuel mixture; in some burners the mixture came through the central pipe, the secondary air through the surrounding annulus, in others the situation was reversed; and a great variety of devices existed to secure proper mixture of fuel and air, easy regulation of proportions, and appropriate velocity.

Advantages of Pulverised Coal

In general the advantages of the use of pulverised coal were: (1) better combustion, since the complete combustion of powdered fuel could be secured, with very little more than the theoretically needed quantity of air, so that the highest possible temperature of combustion may be realised; (2) easier regulation; (3) rapidity of starting and stopping; (4) use of inferior fuels; (5) saving in labour effected by the use of powdered fuel.

On the other hand, there were some disadvantages: The ash was first formed as a fine suspended dust, which tended to settle out, but from its fineness was largely carried on with the products of combustion and was liable to deposit on boiler tubes, on the objects to be heated in the furnace, or in regenerator chambers, if present. Further, these particles of ash might be melted, and would then coalesce and fall on the furnace hearth as a more or less viscous slag.

Early experience also showed that the high temperature of the flame was very destructive of furnace linings, but these troubles had now been largely overcome. Much had been made of the fact that a mixture of coal dust and air in certain proportions was explosive, and explosions had occurred in powdered fuel plants. But investigation had shown that these explosions had in all cases arisen from causes which were preventable, and not inherent in the nature of the operations carried on in the plant; and the possibility of explosion

in a well-designed plant which was properly inspected and kept in order was very remote. With perfect tightness of pipes and containers, thorough ventilation and cleanliness, the avoidance of naked lights, and care in operating the drier, the risk of explosion was reduced to an almost negligible quantity.

It was very difficult to obtain trustworthy figures of the cost of powdered fuel equipment which would hold good in this country; nearly all of those which were published were of American origin, and not many of those afforded a basis for comparison with the cost of working similar furnaces on solid fuel. The following figures, however, supplied by Edgar Allen and Co., Ltd., of Sheffield, afforded a comparison between two reheating furnaces, one worked with powdered coal, the other with solid fuel, over a period of four months of intermittent work, and over a week:—

	Solid fuel.	Powdered fuel.
Turns worked	65½ ..	65½
Steel heated	104 tons ..	163 tons
Slack or coal used	71 tons ..	64 tons
Slack per ton of steel	13'75 cwt. ..	7'85 cwt.
Cost of fuel	£126 2s. 0d. ..	£55 15s. 7d.
Cost of motor	£32 17s. 6d. ..	£32 17s. 6d.
Cost of wages	£19 4s. 0d. ..	£19 4s. 0d.
Total cost per ton of steel ..	£1 15s. 6d. ..	13s. 3d.

	6	6
Turns worked	6 ..	6
Steel heated	9 tons, 9 cwt. ..	16 tons, 10 cwt., 3 qrs.
Fuel used	7 tons ..	5 tons, 12 cwt., 2 qrs.
Fuel per ton of steel	14'8 cwt. ..	6'8 cwt.
Cost of fuel	£13 0s. 0d. ..	£5 4s. 0d.
Cost of motor	£2 12s. 0d. ..	£2 12s. 0d.
Cost of wages	£1 6s. 3d. ..	£1 6s. 3d.
Total cost per ton of steel ..	£1 7s. 0d. ..	11s. 1d.

In concluding, Dr. Dunn pointed out that very little work had been done in this country on Colloidal Fuel; but a proposal which indicated the possibility of running oil-burning installations on a fuel containing only 70 per cent. or less of oil, and of conserving the other 30 per cent. certainly appeared worthy of attention.

In the course of the discussion following the paper, it was pointed out that since mechanical stokers using ordinary coal had an efficiency of some 85 per cent. the pulverised fuel would have little advantage. It was also suggested that it was a pity to use raw coal in that way and that coke would be more suitable if practicable. The paper aroused considerable interest and a hearty vote of thanks was passed.

The Use of Pigments in Rubber

Paper by Dr. Twiss

At a meeting of the Institution of Rubber Industry, held at the Engineers' Club, Coventry Street, Piccadilly, London, on Monday, April 9, a paper on "Rubber Pigments," by Dr. D. F. Twiss (Chief Chemist of the Dunlop Rubber Co., Ltd.), was read and discussed. Dr. P. Schidrowitz presided.

In the rubber industry, the lecturer pointed out, the frequent unimportance of the actual hue of the raw materials employed had had the effect of imparting to the term "pigment" a very wide significance. Some of the most popular rubber-compounding ingredients or "drugs" were truly pigments and in the paint industry were used on account of their colour. Paint pigments, however, had to be in a fine state of division, and it is this feature which was of paramount importance to the rubber compounder. So much so, indeed, was this the case that he forgot the colour factor and frequently applies the term "pigment" to all his "drugs." Whatever opinion might be held as to its desirability or otherwise, this laxity of terminology was of distinct advantage in many ways.

"The use of compounding ingredients with rubber doubtless originated," said Dr. Twiss, "in a desire to increase the apparent bulk of what was an expensive material, but it was early discovered that by wise selection of the additional materials other desirable effects could be simultaneously achieved."

For instance, Charles Goodyear in his *Gum Elastic* (1855) and Thomas Hancock in his *Origin and Progress of the Caoutchouc or India-Rubber Manufacture in England* (1857) both gave interesting accounts of their early experiments and recorded their extensive use of compounding ingredients before the discovery of their respective methods for effecting vulcanisation.

Many of these ingredients were typical pigments and might excusably be considered peculiar to modern practice.

Among other examples it was pointed out that the pigment question took a new phase at the introduction of zinc oxide. The call for white rubber was relatively so small as to render it probable that zinc oxide was first employed as a cheapener. The beneficial effect of zinc oxide as a "reinforcing" or "active" pigment must soon have forced itself on the manufacturer and a new era of rubber-compounding which might well be called the "smoke age" was reached. The extension of popularity to lamp black and gas black or "carbon black" was a natural step. The importance of such ingredients was inestimable. Without them the rubber industry, and particularly the tyre industry, as it existed to-day would have been impossible. By the uninitiated all additions to rubber are regarded as acts of substitution or adulteration. Two striking facts could serve to demonstrate the error of this view. During recent years zinc oxide and gas black had been more expensive than the best raw rubber, but they were indispensable. The recent glut of raw rubber and the sensational fall in price could not create any marked increase in the proportion of rubber in goods demanding great strength, toughness and resistance to wear.

Organic Pigments

The methods for colouring of rubber with organic compounds could be separated into two distinct classes. In one class the rubber was dyed, or, more correctly, stained by some coloured substance soluble in rubber. The early use of bitumen or MR was of this type. Most organic pigments were not soluble in hydrocarbon solvents, amongst which rubber might be included. Such dyes as fuchsin, methyl violet and brilliant green, however, which were of saline character, viz., chlorides of complex basis, could commonly be rendered soluble in hydrocarbon solvents and in rubber by conversion into the corresponding salts of fatty acids, e.g., into stearates, oleates or resinates. Such soluble pigments were especially useful for application to thin and more or less transparent films, although they could also be effective with massive rubber containing a white pigment.

Cold vulcanisation was much less drastic in its demands on a pigment than hot vulcanisation. Even for the former, however, the organic colour had to be carefully selected; basic dyes generally were to be avoided with sulphur chloride. Hot vulcanisation, on the other hand, was much more destructive to organic colours. The avoidance of elevated temperature, which was possible with vulcanisation by the Peachey process or by using mixtures of accelerators capable of acting in solution and at the ordinary temperature, consequently represented a distinct advantage from the pigmentation point of view. Although the uncured mixing might be of brilliant colour, the steam-cured product was commonly of an unattractive drab appearance. Direct contact of the mixing with steam during vulcanisation was particularly harmful to any unstable rubber pigment. Protection of the rubber mixture by enclosure in a mould and reduction of the vulcanising temperature or period by use of a suitable accelerator were partial remedies.

In all probability many experimenters had discovered a few isolated organic pigments capable of satisfactorily withstanding heat vulcanisation. A statement that "vat" and "vat-able" dyestuffs were superior in this respect was of interest as indicating an important avenue for further research. Additional disadvantages frequently attaching to the use of organic colours were high price and lack of intensity. Industrial organic chemistry, however, had made such tremendous advances in the last decade or so that the commercial production of stable organic colours of sufficient opacity and intensity, and suitable for vulcanised rubber, could be confidently regarded as a forthcoming development.

Mineral Pigments

A fundamental difference between the mineral and the organic pigments was the practical insolubility of the whole of the former class in rubber. The significance of this lay in the tremendously important effect produced by uniformly dispersing through rubber a large number of minute undissolved particles. It was well known that the coarser mineral fillers, whether of pigment character or not, did not improve the strength or toughness of the rubber; the stress-strain curve retained its outline, but generally suffered curtailment.

Properties of Different Pigments

The refractive index of a pigment was of importance in connection with its opacity or obscuring power. Magnesium carbonate (refractive index approx. 1.5) in the air exhibited an excellent white colour often superior to that of zinc oxide (refractive index 1.90), but its refractive index was so little different from that of rubber* that its pigmenting effect in rubber was negligible. China clay (1.53) and calcium sulphate (refractive index 1.52) had a similar weakness. The relationship was easily demonstrated by the almost complete invisibility of a glass rod or powder immersed in a mixture of carbon disulphide and petrol adjusted to have the same refractive index as the glass. Powders with refractive index as low as 1.5-1.6 were of little value for pigmenting rubber.

It was not always realised by the outsider that the rubber manufacturer bought his raw materials by the pound, and generally had to sell them—in effect—by the cubic foot.

Tyres, hot-water bottles, and rubber boots were sold as individual units or pairs of standard sizes. To the rubber manufacturer, therefore, the price per 16 fluid ounces of solid pigment was of greater importance than the price per 16 ounces avoirdupois. The specific gravity supplied the necessary conversion factor.

The specific heat of the compounding ingredients similarly extended its influence to the thermal behaviour of a mixing, e.g., during vulcanisation or use. The rate of rise of temperature in a rubber mass to which heat was being supplied would depend (a) on the rate of conduction of heat into the mass; (b) on the specific heat of the mass.

Colour of the Pigments

Except in certain rubber "sundries," colour as a rule was merely an incidental factor in manufactured rubber. The customary production of automobile tyres in either black or white rubber was not a matter of aesthetics. Colour might play an important part in deciding the useful lifetime of vulcanised rubber. The deterioration of vulcanised rubber by age was greatly accelerated by sunlight, the actinic violet and ultra-violet portion of the radiation being mainly responsible. By the use of a suitably coloured rubber these chemically active rays could be more or less effectively excluded. A suitably selected organic dye, for example, would prevent any appreciable penetration of the actinic rays, and convert these into the less harmful heat energy. The, at first sight surprising, selection of antimony sulphide as a standard pigment for motor tubes, which were exposed before sale, might have been influenced in part by similar considerations.

Particle shape was another important feature. It was generally desirable that the particles of all insoluble compounding ingredients for rubber should not be flat (lamellar) or elongated. This doubtless constituted one of the advantages—albeit a minor one—of the "smoke" pigments, which were generally amorphous and non-crystalline.

With decreasing particle-size, the apparent colour of a mineral pigment generally became paler and at the same time its opacity and obscuring power were augmented. It was not surprising, therefore, that such pigments as ultramarine and cobalt blue, the degree of grinding of which is frequently restricted in order to maintain depth of colour, were of limited popularity for rubber manufacture. On the other hand, in the case of white powders, both colour and opacity are increased by a finer state of subdivision, and the particles can advantageously be reduced to minute dimensions. In very fine powders, however, there was an unfortunate tendency to caking and agglomeration, so that in this respect there might be a limit to which fineness could be usefully extended.

Some Individual Pigments

A list of the "pigments" commonly used in the rubber industry would include the various forms of carbonaceous blacks, lead sulphide (and litharge), white lead, zinc, oxide, lithopone, whiting, barium sulphate (natural and "blanc fixe"), strontium sulphate, calcium sulphate, clay and other natural siliceous powders, magnesium carbonate, the antimony sulphide colours, arsenic sulphide, the iron oxide reds, browns and yellows, vermilion, zinc chromate, lead chromate, a few

organic pigments, chrome greens, ultramarine, most of which the lecturer dealt with in detail.

In conclusion the lecturer pointed out that progress in the production of new pigments for the rubber industry was slow, partly because of the conservatism of the rubber manufacturers, but mainly because of the difficult conditions to be satisfied. Before the rubber pigment position could advance much further, decisive steps should be taken to remove the present unnecessary confusion arising from fanciful and often misleading trade names, the number of which was ever increasing. Certain pigments were burdened with a dozen or so alternative names. Such multiplicity was a serious disadvantage to the consumer.

The lecturer finally mentioned his indebtedness to his colleagues, including Mr. E. A. Murphy, Mr. F. B. Jones, B.Sc., and others who, from time to time, had examined the numerous pigments as to their composition and behaviour.

A discussion followed the paper, in which the Chairman (Dr. Schidrowitz), Mr. George C. Lewis (of Binney and Smith, U.S.A.), Dr. H. P. Stevens, Major Lefebure, Mr. W. N. Burbridge, Mr. T. A. Beazley (of the Rapson Tyre Co.), and Mr. Fordyce Jones, took part.

Physics and Sewage Disposal

Paper by Mr. F. R. O'Shaughnessy

MODERN developments in the treatment of sewage were recorded in a paper given before the members of the Birmingham and Midland section of the Society of Chemical Industry by Mr. F. R. O'Shaughnessy at a meeting at the Birmingham University on Tuesday evening, April 10.

The author dealt with the physical properties of the principal components of normal sewage (i.e., of the water on the one hand, and the usual polluting bodies on the other) as affecting those operations preliminary to disposal, comprised under the heading of "Treatment," which were of a preparatory character and for the purpose of facilitating disposal. A clear distinction was made between "treatment" and "disposal." Emphasis was laid on a statement of Fowler's that "the subject of sewage disposal is mainly a question of the separation of solids from liquids." This separation was difficult because of the physical character of much of the solid matter present in sewage, viz., its colloidal or gummy character, which caused it to adhere tenaciously to water. The author's conclusions were: That faecal solids passed into colloidal solution in water by agitation to 220-250 parts per 100,000; that this was the chief source of colloidal solids in normal sewage; and that the amount varied in different sewages. It is shown that whereas the visible suspended solids in sewage were for the most part readily separated, the bulk of the colloidal solids were held very tenaciously by the water of the sewage.

Colloidal Solids

Colloidal solids were very partially thrown down by simple sedimentation, and chemical precipitation effected only partial removal, even when a large amount of chemicals was added, though when in moderate amount it improved the liquor for the bacteria bed. Anaerobic action whilst removing colloids made the liquor very offensive. Aerobic treatment was the only means of precipitating colloidal solids whilst leaving the liquid in a satisfactory condition. It was shown that as aeration was effective and complete so the rate of removal of these troublesome solids was also effective, and that considerations of this character and the observed suddenness with which they were brought down in the top of a percolation bed suggested that given an appropriate agent their removal should be easy and rapid.

The work of F. Wallis Stoddart was reviewed, which indicated that given a limpid sewage liquid which had been freed from colloidal solids by appropriate means, the quantity of liquid which could be put through a suitable percolation bacteria bed might be immensely increased, even to 10 or 20 million gallons per acre. The author then indicated that the technique provided by Messrs. Ardern and Lockett in the activated sludge process had furnished the key to the solution of this problem. A modified use of the technique which for purposes of distinction the author called the flocculated sludge process, was the appropriate means of dealing with colloidal matter in solution.

*The refractive index of rubber appears not to have been recorded in the literature hitherto. Using an Abbé refractometer the writer has observed a value of 1.525 at 15 deg. C. for pale crepe rubber.

Activated Sludge Process

The merits and demerits of the activated sludge proposition was discussed. The advantages were: Completion of sewage purification in one tank in one operation, elimination of nuisance, reduction of area, and production of valuable fertiliser. The objections were: Existing works discarded; sludge problem more complex; economical recovery of sludge problematical; extravagant, *i.e.*, prolonged aeration, high oxygen demand by sludge, alteration of physical character of sludge, etc.; slow rate of solution of oxygen in water, the central physical fact here; and in many cases protection required for aeration. The procedure in this process was arbitrary, its objective largely commercial (conserving manurial elements) and must stand or fall on financial merits.

Flocculated Sludge Process

As to the flocculated sludge process a modification of the activated sludge process, three operations were involved:—Agitation of sewage and flocculated sludge with air for a time to bring about clarification of the sewage and partial purification of the liquor; separation of the sludge from treated sewage; and re-aeration of separated sludge. This mode of procedure was applicable to the whole sewage (less grit, etc.), as in the activated sludge process or after any desired degree of preliminary sedimentation. The advantages were:—A wide choice of procedure; the process might be incorporated with existing plant; greatly increased volumes of liquid might be put on bacteria beds; nuisance (odour and flies) might be eliminated; and the expensive aeration period might be reduced to reasonable proportions.

The theory of the flocculated sludge process was next discussed. Evidence was submitted that the purification of sewage was effected by two distinct means:—By physical agents which bring about flocculation of colloidal solids, and by biological agents which bring about oxidation of the dissolved impurities. In the activated sludge technique the real flocculating agent was the sludge. Evidence was given that the condition of the sludge was much more important than its quantity and that with the procedure advocated in the flocculated sludge process very remarkable and rapid purification might be obtained with greatly reduced volume of sludge. Thus the flocculated sludge was apparently the vehicle for the transference of energy. By eliminating easily separable material from the sewage the oxygen demand of unprofitable or useless elements was reduced and consequently the efficiency of the action very greatly increased.

As to the sludge treatment, the whole question was presented thus:—The bulk of the solids may be separated from the bulk of liquid in the crude sewage quite readily. When separated the peculiar physical properties of the solids assert themselves, thus:—(a) The solids (sludge) adhere most tenaciously to about 9 times their weight of water. (b) The sewage liquor adheres with great tenacity to about 20-25 per cent. of the solids of the original sewage.

The problem presented in each case was the same, *viz.*, the modification of the physical character of the colloidal solids. In the case of the sludge this change was conveniently effected by the inoffensive intensive, anaerobic digestion of the sludge as by the Imhoff tank or by the method of separate digestion as at Birmingham (England) and Baltimore, U.S.A., and elsewhere. It was claimed that the cost of the latter method was relatively low.

Low Temperature Carbonisation

Some Practical Suggestions

MR. J. STANLEY-MORGAN, M.Sc., read a paper on Low Temperature Carbonisation before a recent meeting of the Northern Section of the Coke-Oven Managers' Association at Durham, Mr. T. Johnson, B.Sc., being in the chair.

Various processes, he said, which had been devised had been strongly criticised by responsible persons as impracticable, but he believed that low temperature carbonisation was likely to become a great industry, especially as three main products would be obtained—gas, oil, and solid fuel. The fact that the idea was revolutionary should not prevent its serious consideration. Many of the earlier experiments in this direction had not given very satisfactory results. The greatest difficulty was in heating the coal evenly to a temperature of 500°-600° C. He did not know what the final solution of the problem would be, but in 1918 at Skinningrove he was in a similar difficulty with regard to the heating of

charcoal. This was solved by immersing the charcoal completely in molten lead.

The Use of a Lead Bath

The heating to the required 350° C. took 15 seconds as against four hours. They tried wood, coal, some shale produced by Mr. Bury from the East Riding, palm nut shells from West Africa, and in every case got most encouraging results. It was true that with coal there were difficulties. Since that time, with the assistance of Messrs. Woodall, Duckham and Jones, Ltd, London, who formed a Research Committee to exploit the process, the lead bath had been successfully applied on a large scale to the distillation of coal tar oil and many other things. He had used it for widely different purposes, such as alkali fusion, for synthetic phenol and beta naphthol, and the drying of many other things, including coal. It seemed to him the most obvious way to distil coal. With powdered coal, the time-factor would be of the order of two minutes as against hours in other processes.

The process conformed more closely to the ideal than any extant, as they got a very rapid distillation, each particle of coal being treated equally, the gas vapours got away quickly, and little or no cracking ensued. The liquid products were very fluid, containing very little pitch and of excellent quality. The yield of petrols was greater than that of benzols by the higher temperature process. The gas was of high quality, about 750 B.Th.U.'s, and, as it was only formed to the extent of about 4,500 to 5,000 cu. ft. to the ton, the condensing capacity was reduced to the minimum. They had, therefore, a retort which was of low capital cost because of its high rate of treatment and a condensing plant of smallest dimensions. They should produce a saleable fuel which would give smokeless fires, but which would burn pleasantly. The semi-coke would be better than coal for steam raising. There was no process using the solid fuel which could not, with advantage, use the semi-coke. The gas would be far better in every respect than that at present distributed; it would be richer, less poisonous, less liable to choke in mains, no naphthalene being present, and it would cost less to purify, containing no high temperature sulphur compounds such as carbon disulphide, and it would be cheaper. There would be a large quantity of ammonium sulphate formed in the primary distillation, and since subsequent treatment in the producers would be simple owing to the absence of tar, it was probable that a very large total increase might result.

Possibilities of the Industry

If the gasworks were to adopt the method they would be able to deal with a much greater quantity of coal with the existing purifying plant. At present 17,000,000 tons of coal were carbonised annually in gasworks. For the purposes of argument, supposing they could deal with 50 million tons by low temperature methods they should get a yield of one thousand million gallons of tar which would give 150,000,000 gallons of petrol and go far to meet the requirements for motor car propulsion. In view of the tendency to utilise Diesel engines afloat, the 70,000,000 gallons of heavier oil should make us, as a country, entirely independent of external supplies, especially if we carbonised some of the coal used industrially. We should produce about 750,000 tons of ammonium sulphate from that source alone as against a present total of about 450,000 tons, which would enable the country to produce far bigger crops than at present and provide a large revenue from export, being, in addition, an absolute safeguard in time of war.

When the right process was found, nothing would prevent its rapid extension; monopolies and vested interests in gas undertakings would either come into line or go out of business. In the past, low temperature carbonisation had been a hobby, and processes had been used which produced a fuel sold at a price to please few people, and the gas was wasted. If coal were treated as he had indicated they could not afford to waste the gas, and he was sure there would be no complaint as to the cost of gas, nor would one be able to poison oneself by intent or accident.

In the discussion following the paper the Chairman pointed out that apparently there were no toluene or other aromatic products, which was a considerable drawback. Replying to other speakers Mr. Stanley Morgan stated that the tar produced required less working up than any other known tar and also that the lead bath practically did not deteriorate with use.

Chemical Matters in Parliament

Dangerous Drugs and Poisons

IN the House of Commons on April 9, the Dangerous Drugs and Poisons (Amendment) Bill was read a third time. During the discussion (Mr. Clayton (Widnes) appealed to the Home Secretary to make the same concessions to the licensed wholesale druggists as he had made to the medical profession and the Pharmaceutical Society. At present, he said, they were liable to the same penalty as illicit dealers in the drugs. Mr. Bridgeman, in reply, said he could not agree to reduce the penalty for the breach of the conditions of a licence. Such a breach might be quite as serious as any other dealt with by the Bill.

The Gretna Factory

Dr. Chapple (House of Commons, April 9) asked the Financial Secretary to the War Office whether he proposed to reconsider the report of the Pearson Committee set up in February, 1919, which advised the Government to continue the use of such part of the Gretna factory as might be necessary for the manufacture of explosives, and develop the rest of the buildings and plant for other industries.

Mr. Gwynne (Financial Secretary to the War Office) replied that the greater part of the explosive plant had already been sold, and he saw no reason to question the decision taken in the matter.

The German Potash Industry

IN an extract forwarded to the Department of Overseas Trade by the Commercial Secretary at Cologne (Mr. C. J. Kavanagh), the *Deutsche Bergwerks Zeitung* of March 24 states that, according to the latest information, a number of potash works in Central Germany have been compelled to restrict work owing to unfavourable sale conditions. During 1922 boom conditions prevailed on the potash market, but in January of this year sales had already weakened, and the sale figures did not equal those of January, 1922. Fears were expressed that inland business would suffer a considerable decrease this year. These fears have now been realised. The German agricultural industry has greatly restricted its orders during the past few weeks, and in part has stopped them altogether, the cause of which is to be found in the disparity between the costs of production and the sale prices for agricultural products.

It was to be foreseen that the improvement of the mark and the accompanying price reduction would also have its dark side. In the interests of guaranteeing food supplies, special attention will in the near future have to be given to agricultural conditions. The price reduction in corn, potatoes, etc., is in no proportion to the reduction in the costs of production, and landowners are, therefore, no longer in a position to devote the same expenditure as heretofore to the supply of artificial manure.

It goes without saying that the potash industry has been hard hit by the decline of the inland demand, and we understand that a great number of potash works have had to restrict work and to work for stock. Export sales do not recompense for the loss of the inland business. The potash business with America has not justified expectations, and it is, moreover, reported that the Alsatian potash works are doing their best to obtain the American market and are underbidding. The American farmer is, therefore, assuming a certain aloofness, expecting, no doubt, that the German potash works will also soon be compelled to reduce their prices.

The price question is to-day, in fact, the essential point in the sale problem. On the one hand, should the present prices be retained there is no hope of increasing sales, and the closing down of works will be unavoidable. A reduction, on the other hand, endangers, in view of the increased costs of production, and especially in view of the increased wages, the financial basis of the potash industry, which has only just been re-established. As, however, in the present conditions, the economic policy of the various industrial groups is dictated in the first place by general economic reasons, the potash industry will, no doubt, decide upon a reduction of its prices in order to revive inland sales. We understand that it is already being considered to what extent this will be possible.

Nitrates from the Air

A Review of the Arc Process

THE first of a series of three Cantor lectures on "Nitrates from the Air" was given by Mr. E. Kilburn Scott, M.I.E.E., A.M.Inst.C.E., on Monday before the Royal Society of Arts, London, Mr. Menzies being in the chair.

The lecturer pointed out that there was an enormous and increasing use of combined nitrogen, and quoted figures to show that the consumption to-day was about double that of ten years ago. The principal use in peace time was for fertilisers, while in war time nitrates were essential for explosives. He emphasised the British weakness in this direction in depending on imported nitrate.

He then went on to consider the arc process for obtaining nitric acid from the air. This had the advantage of costing little for raw materials. The various types of furnaces in use were those in which a spread arc was obtained by a moving part in the furnace, or by a magnetic field. Others had a rod-like arc in a whirling air column. All these used single-phase current. Three-phase furnaces had been recently introduced in Switzerland by Norwegian engineers with improved results. He considered some of the details of the furnaces, the nature of the refractory materials, etc. After passing through the furnace the gases were cooled from 1,000° C. to 250° C. in a boiler, which raised sufficient steam for evaporating all liquors, and gave a reserve for turbo-generators. Further cooling took place in an aluminium cooler. He also referred to types of absorbing towers for the gases, and mentioned that in recent processes expenses at this end had been much reduced.

With regard to yield, 60 to 70 grammes of combined nitrogen were obtained per kilowatt-hour, and though the theoretical thermodynamic efficiency was only 1.5 per cent., commercially the efficiency was very good and the Norwegian companies were financially a great success. Most of the arc plants were built by Norwegian engineers, though there was a very large one in America belonging to the Government, built for war purposes, which Mr. Henry Ford had offered to take over for the manufacture of fertilisers. The product of the process was usually calcium nitrate, which was preferred in some districts to Chile nitre, especially where the soil was already alkaline, as in California.

Packing of Goods for Export

Modern Stencilling Methods

THE importance of correctly marking and addressing goods for export has frequently been pointed out, particularly in the case of round or awkwardly-shaped packages. Various steamship, railway and carrying companies have issued regulations and recommendations as to marking cases, drums and other containers. Several of our readers have expressed interest in this matter of stencilling, and a few further particulars may be of use.

The ordinary hand-cut zinc stencil, costing a few pence per letter, is suitable for marking flat surfaces, but is generally used only when a quantity of cases require the same lettering. Where a smaller number of cases bearing similar lettering are being dealt with, interlocking metal stencils are used. These two kinds of stencils are practically the only types largely used in this country, and neither of them are of much service for marking drums, kegs, or other packages having curved surfaces.

Where plenty of labour is available users have found it possible to cut stencils from manilla paper or thin cardboard by hand. These stencils will mark round surfaces, but are not at all durable until they have been treated with oil, varnish or paint.

Machines for cutting flexible and durable stencils have recently been introduced into this country. They cost about the same as a good typewriter, and are undoubtedly a good investment for those who have much stencilling to do. These machine-made stencils are cut out of a leather-tough oilboard, at a fraction of the cost of the old rigid stencils. They are said to be strong enough for making at least a thousand marks on any sort of surface, and can be supplied to such firms as do not need to have machines of their own. These stencils are available to London users at a cost of a few pence, and can be cut in a few seconds by the Diagraph Stencil Machine Co., Ltd., 82, Mark Lane, E.C.3, or sent to country users by return of post.

From Week to Week

THE PRAGUE CORRESPONDENT of *The Times* telegraphs that the Czecho-Slovak Government has sold fifty milligrammes of radium to a firm in China.

THE SOUTH YORKSHIRE CHEMICAL WORKS CO., LTD., are proposing to extend their works at Greasborough, Rotherham, originally established by Earl Fitzwilliam.

THE THIRTY-FOURTH CONGRESS of the Royal Sanitary Institute is to be held at Hull from July 30 to August 4. It will be presided over by Mr. T. R. Ferens, High Steward of Hull.

MR. W. J. U. WOOLCOCK, general manager of the Association of British Chemical Manufacturers, has been admitted to the Freedom of Brotherhood of the Company of Dyers in the City of London.

THE FOURTH and last of the series of Keith lectures was delivered by Dr. Hope Fowler in the Royal Scottish Society of Arts Hall, Edinburgh, on April 9. The direct application of X-rays was the subject of the lecture.

AT A MEETING of the Institution of Petroleum Technologists held at the Royal Society of Arts, London, on Tuesday, Mr. A. E. Chambers, A.M.Inst.C.E., read a paper on "Potrero No. 4," being the history of one of the largest oil wells in Mexico.

WE ARE INFORMED that Fl. Bourgeois, of 18 and 19, Great St. Helens, London, E.C.3, has been appointed sole London agent for the products of the Stockton-on-Tees Chemical Works, Ltd., of Stockton-on-Tees, manufacturers of barium products, iron perchloride, etc.

MR. F. D'ARCY COOPER, partner in Cooper Brothers, the well-known accountants, has been appointed joint vice-chairman of Lever Brothers. The other vice-chairman is Mr. H. R. Greenhalgh. Mr. Cooper's firm has been associated ever since its foundation with Lever Brothers.

THE QUESTION of further reductions in railway goods rates was considered at the monthly meeting of the Railway Managers' Committee in London on Tuesday. No decision was arrived at, the further discussion of the matter being adjourned till next week, when a special meeting will be held.

THE SELBY ENGINEERING CO., LTD., of 92, Fenchurch Street, London, E.C.3, announce that they have recently been appointed sole agents by the Navaline Manufacturing Co., of Rotterdam, Holland, for the sale of "Navaline" lacpaint, a new quick-drying enamel suitable for practically any kind of painting work.

A PROCESS for manufacturing a completely odourless soap from naphthene acid has been perfected in Berlin. It is stated in the *Seifensieder Zeitung*. The process, which is a relatively simple one, has been patented by the Erdoel u. Kohlewertung A.G. of Berlin and Dr. Franz Zernik, and adds considerably to the usefulness of naphthene acid.

TWENTY-SIX per cent. of all the dyes imported into the United States in February were German reparations dye-stuffs, sold on the American market by Italian concerns, according to Department of Commerce statistics. The total quantity of dyes imported in February was 191,709 pounds, with an invoice value of \$199,640.

SIR JOSEPH J. THOMSON, Trinity College, Cambridge, delivered the principal public address of the meeting of the American Chemical Society in New Haven on Wednesday, April 4. His subject was "The Unity of Physics and Chemistry." During last week he gave a series of lectures before the Franklin Institute of Philadelphia.

THE JOINT INDUSTRIAL COUNCIL for the Chemical Trade will meet again on April 19 to deal with the question of the proposed reduction in wages of $\frac{1}{4}$ d. per hour by certain firms, for shift-workers as from May 1 next. Some 50,000 workers are involved, the chief areas being London, Manchester, Birmingham, Leeds, Stafford, Newcastle, North and South Wales.

AT A GENERAL MEETING of the members of the Royal Institution held on Monday, the Duke of Northumberland (president) in the chair, a resolution of condolence with Lady Dewar on the death of Sir James Dewar was moved by the president and carried unanimously. Mr. Arrol Moir, Professor A. O. Rankine, Lady Wallace, and Miss Williamson were elected members.

The American Philosophical Society has awarded to Sir Joseph John Thomson, discoverer of the electron, the John Scott Medal and an accompanying purse of \$1,000 and also the Franklin Medal, the highest award of the Franklin Institute. The John Scott Medal and a prize have also been awarded to Professor Francis William Aston, of Trinity College, Cambridge, for contributions to medical science.

AT THE INQUEST held on an employee who was killed at the Saltley gasworks explosion last month, a verdict of "accidental death" was returned. The explosion was found to have been totally unavoidable and to be due to external hammering on a pipe under repair having dislodged carbon deposit inside, which upset the flow of gas and ultimately allowed air to enter, forming an explosive mixture.

AMONG the Firms who have accepted invitations to the Duke of York's wedding are Thomas Firth and Sons, Ltd., Sheffield; Rose Downs and Thompson, Ltd., Hull; The "Sentinel" Waggon Works (1920), Ltd., Shrewsbury; Brunner, Mond and Co., Ltd., Northwich; the North British Rubber Co., Ltd., Edinburgh; Lever Brothers, Ltd., Port Sunlight; and Mander Brothers, Wolverhampton.

MAJOR LEFEBURE contributed an article to the *Evening Standard* on April 5, on "Chemical Warfare Perils," with special reference to the political aspects of the question. He disagreed with the often-quoted remark in this connection that "What science devises, science can protect against," since in warfare the advantage gained from the introduction of a new weapon could not be countered immediately, and the delay was of first importance to the aggressor.

REPLYING TO A QUESTION on Export Credits Scheme, Lieut.-Colonel Buckley (Parliamentary Secretary, Overseas Trade Department) informed Mr. Hannon, the member for Mosley, in the House of Commons on Tuesday, that the total advances made under the exports credits scheme amounted to £1,752,150, while guarantees had been given to the total amount of £2,759,422, of which £315,122 was in respect of goods exported to the British Empire.

OWING TO SMALL COAL having risen to a phenomenally high price, patent fuel manufacturers in South Wales have been refusing to quote for any new business. With the settlement of the Rhondda Valley strike, however, conditions will become easier, and in view of the fact that the importation of American pitch has materially reduced the cost of one of the raw materials, the industry is looking forward to a period of considerable activity.

MR. R. E. KIMENS, C.M.G., commercial secretary to His Majesty's Legation at Warsaw, will be in attendance at the Department of Overseas Trade for one week commencing on April 18. During that period he will be prepared to interview, by appointment, United Kingdom manufacturers and merchants interested in trade with Poland. Application for interviews with Mr. Kimens should be addressed without delay to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. The reference, 4672 T.G., should be quoted in all applications.

The first joint annual dinner of the Society of Chemical Industry (Newcastle Section), Institute of Chemistry (Newcastle Section), and the Newcastle Chemical Industry Club has been arranged for the Royal Turks Head Hotel, Grey Street, Newcastle, at 7.30 p.m., on April 20. Amongst other guests who have accepted invitations are the Lord Mayor of Newcastle-upon-Tyne; The President of the Society of Chemical Industry (Dr. E. F. Armstrong); the President of the Institute of Chemistry (Mr. A. Chaston Chapman); Professor P. P. Bedson, Mr. R. B. Pilcher and Dr. J. P. Longstaff. Dr. H. Peile will take the chair.

AN EXAMPLE of fuel economy in "the shortest month of the year," is supplied by Meldrums, Ltd., Timperley, who announce that they have supplied forced draught furnaces to three tar distilleries; three gasworks; a dyeworks; a tannery; a municipal technical college; a corporation chemical works; two engineering works; a waterworks (5 boilers); three laundries; an Indian spinning mill; three furnaces for drying tar macadam; forced draught to two reverberatory furnaces at a steelworks (repeat). Other installations are:—Refuse destructors for a hospital; an urban district council; and a mineral water manufacturer.

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Abstracts of Complete Specifications

194,339. PRECIPITATING OR RECOVERING METALS FROM THEIR SOLUTIONS, PROCESS FOR. H. Bardt, 818, Agustinas Street, Santiago, Chile. Application date, October 10, 1921.

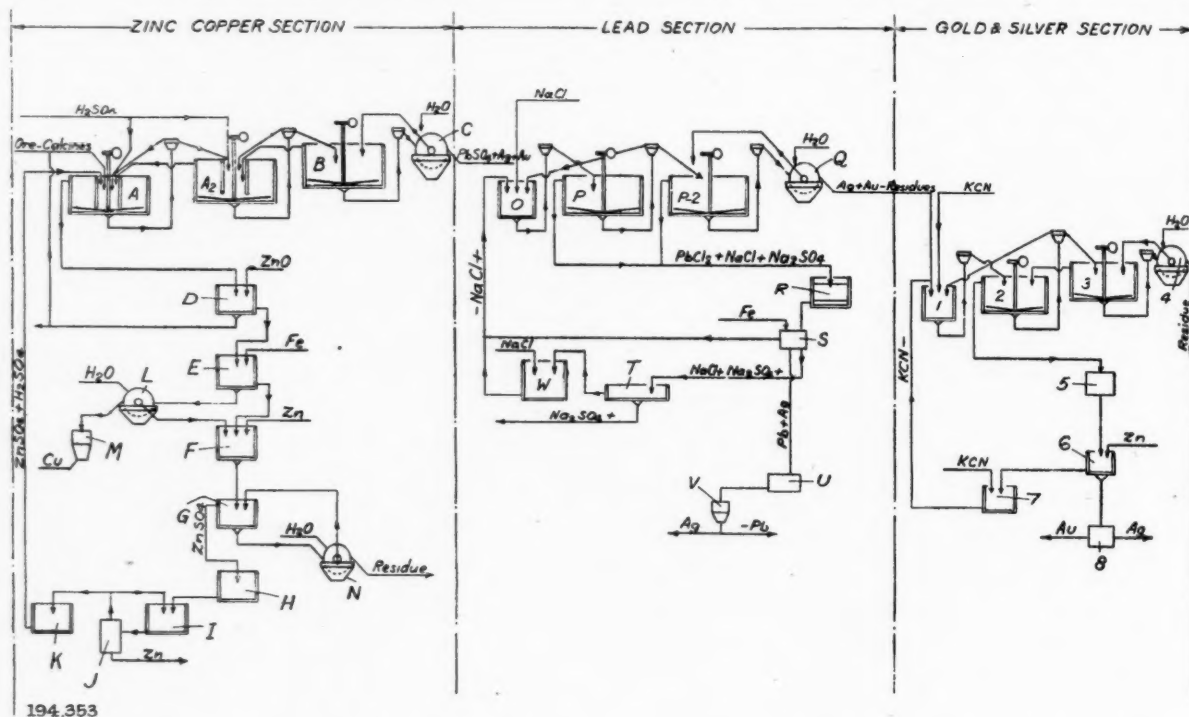
The process is for recovering metals such as copper, silver, mercury or gold, from their solutions. The solution is mixed with an organic material containing poly-saccharides, such as sawdust, sugar molasses, straw, waste liquor from the manufacture of cellulose, or other vegetable material, and heated to a temperature of 120° – 150° C. under the corresponding pressure. The metal is precipitated as a fine powder which may be separated by filtering. This process yields precipitated metal which is not contaminated with other metals as in the process of precipitation by more electro-positive metals, and the acid is also recovered so that it may be used for dissolving further quantities of metal.

density, and maintaining a high percentage of free perchloric acid in the electrolyte.

194,353. RECOVERING METALS CONTAINED IN ORES, PROCESS FOR. H. S. Mackay, 4, Broad Street Place, London, E.C.2. Application date, November 11, 1921.

The process is for recovering separately in successive stages, metals such as zinc, copper, lead, silver, gold, from complex ores such as sulphide ores. The ore is crushed and then roasted to convert the metal sulphides into soluble compounds, and then leached with sulphuric acid. The copper and zinc are dissolved, and then recovered electrolytically from the solution. The residues are leached with sodium chloride or ferrous chloride to extract lead and silver, which are then recovered by precipitation with a more electro-positive metal. The residues are then leached with potassium cyanide to dissolve the gold, which is then recovered.

Recovery of Zinc and Copper.—The calcined ore and sulphuric



194,340. ELECTRODES SUITABLE FOR ELECTROLYTIC CELLS, PROCESS FOR THE MANUFACTURE OF. H. Bardt, 818, Agustinas Street, Santiago, Chile. Application date, October 10, 1921.

The process is for the production of electrodes composed mainly of manganese peroxide or lead peroxide. In the usual process, manganese nitrate is decomposed by heat, but the electrodes thus produced contain considerable quantities of non-conducting amorphous manganese peroxide, mixed with the crystalline modification. Further, the electrodes are not produced in a compact form. Electrodes of lead peroxide produced by electrolytic oxidation of lead oxide, or electrodeposition of the peroxide on an insoluble anode of iron or carbon, are fragile and not durable. It is now found that manganese or lead peroxide may be electrolytically deposited in a compact condition, and having high conductivity, by using a solution of perchlorate or manganese or lead containing a high percentage of free perchloric acid. The supporting substance may be ferro-silicon, magnetite, graphite, etc., and need not be removed after the peroxide is deposited. The electrodes thus obtained have a smooth surface, which may be modified to give a very large surface area by subsequently increasing the current density by a multiple of the original

acid are fed to the central chamber of a Dorr thickener agitator A, the agitation with air taking place in the central chamber and the settling of the residues in the outer chamber. The residues are transferred to another thickener agitator A², from which the clear solution returns to the agitator A, and the residue is passed to a thickener B, the solution from the latter returning to the agitator A². The copper and zinc are thus dissolved, and the iron and aluminium converted into ferric sulphate and aluminium sulphate. Zinc oxide is then added in an agitator D to form more zinc sulphate, and thus enable the acid to be recovered on electrolysis, and also to precipitate impurities such as bismuth, arsenic and antimony. Iron and aluminium are precipitated as hydroxides. The precipitates from the agitator D may be treated for the recovery of zinc oxide, if in sufficient quantity. The solution passes to an agitator E, where iron dust is added to precipitate most of the copper, antimony, bismuth, and arsenic, and the residues are recovered in a filter press L and then smelted or roasted. The solution from the agitator E and filter press L pass to an agitator F, where zinc dust is added to precipitate any remaining cadmium, iron, cobalt, nickel, antimony, bismuth, copper and arsenic. The mixture passes to a Dorr thickener G, from which the precipitates pass to a filter

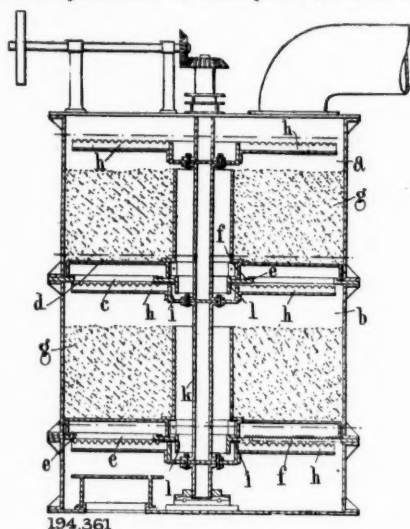
press N, and the solution to a filter H and storage tank I. The zinc is recovered, and sulphuric acid regenerated in electrolytic cells J, from which the acid solution is returned to the agitator A.

Recovery of Lead and Silver.—The lead residues from the filter press C are treated in a Dorr agitator O with a chloride solution, and the mixture treated in thickeners P, P². The solution passes to a filter R, and thence to a drum S where lead and silver are precipitated on iron. The solution then passes to a tank T where sodium chloride or ferrous chloride crystallises, or the solution may be replenished with chloride in the tank W and returned to the agitator O. The residues pass to a filter press Q from which the solution returns to the thickeners P, P².

Recovery of Gold and Silver.—The residues from the filter Q are treated in a similar manner with potassium cyanide in agitators and thickeners 1, 2, 3, from which they pass to a filter press 4. The solution passes to a filter 5, and then to a tank 6 where gold and silver are precipitated with zinc dust and the solution from the latter is replenished with potassium cyanide and used again. The method of recovering lead and silver may be used separately for the treatment of lead-silver ores.

194,361. WASHING AND SCRUBBING OF GASES, APPARATUS FOR. E. Cockey and Sons, Garston, Frome, Somerset; H. K. Hiller, 39, Victoria Street, London, S.W.1; and J. F. Harrison, 34, Rowallan Gardens, Partick, Glasgow. Application date, December 3, 1921.

The apparatus is for washing gases containing ammonia, carbon dioxide, sulphuretted hydrogen, etc. A number of superposed compartments *a, b* are provided with radial slots



or gas inlets *c*, each of which is covered with a radial hood *d* surrounding an upstanding flange *e*. The lower edges of the hoods *d* are serrated to subdivide the gas which passes below them. Each compartment is filled with porcelain rings or the like, to which the absorbing liquid is supplied from perforated radial troughs *h*. These troughs are mounted on a central rotating vertical shaft *k*, so that the liquid is uniformly distributed. The liquid overflows from each compartment to a central receiver *i*, from which it passes to the next series of troughs *h*. The compartments may be isolated from one another so that separate purifying liquids may be employed.

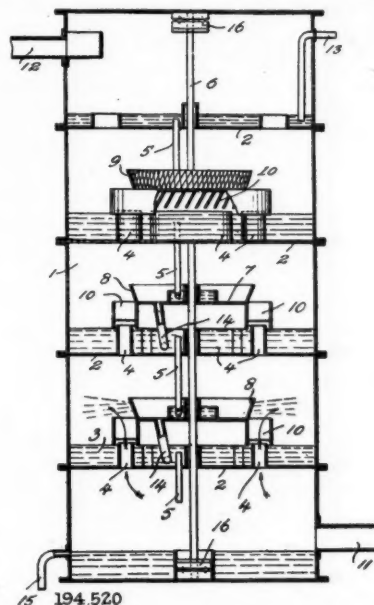
194,428. ELECTROLYTIC CELLS. J. Cranston, 55, Washington Avenue, Trenton, Mich., U.S.A., and W. D. Le Bar, 116, Cherry Street, Wyandotte, Mich., U.S.A. Application date, December 17, 1921.

An electrolytic cell more particularly for the production of chlorine and alkaline liquor is provided with a body portion of impervious material such as slate, having openings in its side walls, and containing the anodes. The cathodes are formed of plates arranged externally against the openings in the side walls, and having openings through which the electrolyte may pass. The lower edges of the cathodes are turned up to

form troughs which receive the electrolyte passing through the perforated electrodes. The outer side walls of the cell are formed of plates spaced from the electrodes and dipping into the liquid in the troughs, so as to constitute liquid seals. The spaces between the outer plates and the cathodes thus form gas-collecting chambers to receive any gas generated from the liquid in the troughs.

194,520. GAS OR AIR WASHERS OR SCRUBBERS. J. B. Hansford, The Gas Works, Ford End Road, Bedford. Application date, February 20, 1922.

The apparatus is of the kind in which the liquid distributing device is rotated by the current of gas. A cylindrical chamber *1* is divided into a number of superposed compartments by



transverse partitions *2*, which are shaped to contain the scrubbing liquid *3*. The liquid passes downward from each compartment to the next through pipes *5* and the gas passes upwards through ports *4* in the partitions. A vertical shaft *6* carries annular trays *7* in each compartment, having apertures or notches in their sides *8*. Alternatively, each compartment may contain a series of trays. The under side of each tray carries depending vanes *10* arranged immediately above the ports *4*, so that the velocity of the gas rotates the trays. The washing liquid is sprayed from the trays by centrifugal action into contact with the gas. Depending pipes *14* may be attached to each tray to scoop up the liquid from the trough immediately below.

194,556. GRINDING OR CRUSHING MILLS. A Fischer, 11, Dreieckstrasse, Hagen in Westfalen, Germany, and G. O. Pfarr, 11, Hohenzollernstrasse, Barmen, Germany. Application date, March 24, 1922.

The mill is of the kind in which grinding takes place between an inner rotating conical member and a fixed outer conical member which encloses it. The grinding member is composed of comparatively thin flat plates or rings which are superposed on one another and bolted together. The outer edges of the rings constitute the conical grinding surface, and the outer fixed-grinding surface is composed of similar rings. The grinding surface of each ring is provided with uniform grooves or riflings which are slanting or spirally directed. The comparatively small thickness of the rings enables the rifling of each ring to be of the same pitch from top to bottom. When the rings are placed in position, a grinding space of uniform width is obtained having uniform slanting or spiral riflings.

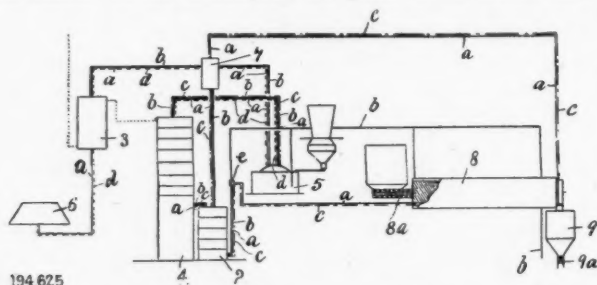
194,567. DYESTUFF PREPARATIONS FOR HOUSEHOLD USE. F. Parker and H. M. Parker, 4, Compton Terrace, Islington, London, N.1. Application date, April 18, 1922.

The object is to obtain dyestuff preparations for household use which are more readily handled and may be packed and

stored without deterioration. A basic, acid, or "union" dye preparation is made by mixing an aqueous solution of the dye with a jelly obtained by boiling a mixture of Irish moss (carrageen or *Chondrus crispus*) and water. The jelly is mixed while hot with salicylic acid, and also an "assistant" according to the class of dyestuff used. In the case of a union dyestuff the assistant may be Glauber salt in the proportion of 4 parts of the salt to 3 parts of the Irish moss. The jelly obtained is incorporated with 10 per cent. by weight of the dyestuff, the product being a soft jelly which is mixed with boiling water when required for use.

194,625. SULPHATE OF AMMONIA, MANUFACTURE OF. R. P. Douglas, 12, Nelson Square, Bolton, Lancs. Application date, August 17, 1922.

In the usual process for manufacturing sulphate of ammonia, steam is passed into the ammoniacal liquor to heat it and carry off the ammonia gas to the saturator. The object is to avoid the large quantity of steam necessary to carry the ammonia to the saturator, and to substitute air as the carrying agent, so as to avoid the necessity of condensing large quantities of steam. In the illustration, the paths of air, steam and



ammonia through the apparatus are represented by separate lines *a*, *b*, *c*. Steam *b* is passed through an air injector *c*, and the mixture of air and steam passes into the fixed still 2, where ammonia is generated, and the mixture of air, steam and ammonia pass into the free still 4, together with gaseous impurities *d*. The mixture then passes to a saturator 5, where the ammonia is absorbed in sulphuric acid. Air, steam and the impurities then pass to a condenser or heat exchanger 3, where steam is condensed, and the impurities are then absorbed in the oxide purifier 6. Alternatively, the air may be introduced partly into the still 2 and partly into some other part of the plant. A portion of the mixture of air, steam and ammonia may be withdrawn from the fixed still 2, the steam removed from it, and the ammonia and air passed into the acid sulphate to neutralise it. In this case the mixture is passed through a reflux condenser 7 to remove the steam, and the air and ammonia then pass to a vessel 8, into which the acid ammonium sulphate is also fed by a conveyor 8^a. The ammonium sulphate is thus neutralised and dried, and then passes to the receiver 9. The remaining gas, which now contains less ammonia, passes through the injector *c* back to the still 2. The air may also be introduced into the free still 4, or only into this still. In the latter case the gases withdrawn from it to neutralise the acid sulphate would require purification in a lime or oxide purifier.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 174,569 (Grissom-Russell Co.) relating to apparatus for fractional condensation of petroleum or other vapours, see Vol. VI., p. 433; 174,611 (E. Zerner) relating to a process of oxidising liquid hydrocarbons, see Vol. VI., p. 465.

International Specifications not yet Accepted

192,703. UREA SOC. D'ETUDES CHIMIQUES POUR L'INDUSTRIE, 8, Quai du Cheval Blanc, Geneva. International Convention date, February 4, 1922.

A solution of cyanamide is heated in a lead-lined autoclave at a pressure of 5 atmospheres, to 65°–70° C. for six hours in the presence of an acid. The acid may be sulphuric, nitric or phosphoric, or acid salts such as acid sodium sulphate may be used, and should be in a proportion of less than 10 per cent. of that necessary to combine with all the urea produced by the reaction.

LATEST NOTIFICATIONS

- Allsebrook, W. A. Process for colouring rubber, linoleum, etc. 8,265. March 23.
 Aluminium Co. of America. Coating aluminium. 8,356. March 23. (United States, April 3, 1922.)
 —Coating aluminium. 8,357. March 23. (United States, May 8, 1922.)
 —Coating aluminium. 8,358. March 23. (United States, March 7.)
 Dunford and Elliott (Sheffield), Ltd. Manufacture of zinc. 9,797. March 20. (Sweden, March 21, 1922.)
 Verein für Chemische und Metallurgische Produktion. Production of chemically-pure hydrochloric acid. 7,813. March 19. (Germany, April 13, 1922.)
 195,345. Process for the chlorination of methane. Holzverkohlungs-Industrie Akt.-Ges. March 27, 1922.
 195,366. Manufacture of hypochlorites. Mathieson Alkali Works, Inc. March 25, 1922.
 195,374. Methods and means of facilitating physical or chemical reactions in piled bodies. Deschamps, J. J. March 21, 1922.
 195,382. Process of apparatus for the manufacture of zinc. Dunford and Elliott (Sheffield), Ltd. March 21, 1922.

Specifications Accepted, with Date of Application

- 173,757. Sulphonated coumarone resins, Manufacture of salts of, Gerb-und Farbstoffwerke H. Renner and Co., Akt.-Ges., January 8, 1921.
 174,077. Low-temperature tar, semi-coke and gas, from solid carbonaceous materials, Process for the production of. J. Weiss. January 13, 1921.
 174,078. Arseno-compounds, Process of preparing. Farbwerke vorm. Meister, Lucius and Brüning. January 13, 1921.
 178,106. Waste heat of gases and vapours in cellulose factories, Process of recovering. Zellstofffabrik Waldhof. H. Clemm and A. Schneider. April 11, 1921.
 195,107. Hydrocarbons, Treatment of, by hot gases. A. J. H. Haddan. (A. J. Paris, Jun.). September 24, 1921.
 195,113. Mineral particles, Process to facilitate classification and to reduce losses in ore dressing by the aid of chemical substances. R. H. Smythe. September 14, 1922.
 195,117-8. Esters, Process of producing high grade. E. C. R. Marks. (U.S. Industrial Alcohol Co.). November 11, 1921.
 195,153. Colloidal matter from liquids, Effecting the recovery or separation of—and apparatus therefor. T. W. Barber. December 22, 1921. Addition to 132,947.
 195,181. Titanium pigments, and method of producing same. H. H. Buckman. January 4, 1922.
 195,239. Endothermic gas reactions, Process for carrying out. O. Y. Imray. (H. Andriessens and Soc. of Chemical Industry in Basle.) February 23, 1922.
 195,290. Fatty oils or the like, Process for oxidising. R. Arends. May 2, 1922.
 195,295. Alumina, Manufacture of pure. A. L. Pedemonte. May 5, 1922.

Applications for Patents

- British Arca Regulators, Ltd. Automatic control. 8,989. March 29.
 Bruni, G. Production of phosphoric derivatives of inositol. 8,870. March 28.
 Cassella and Co. Ges., L., and Ransford, R. B. Manufacture of alkylated derivatives of vat dye-stuffs. 8,837. March 28.
 Courtaulds, Ltd., and Diamond, C. Treatment of cellulose. 8,967. 8,968. March 29.
 Dudley, H. W. Manufacture of purified insulin. 8,715. March 27.
 Imray, O. Y., and Society of Chemical Industry in Basle. Manufacture of soluble acid calcium salts of inosite-phosphoric acid. 9,004. March 29.
 Laporte, Ltd., B., and Stewart, R. Manufacture of barium peroxide. 8,576. March 26.
 Peachey Process Corporation, Ltd. Treatment of material with gases. 8,497. March 26.
 Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. Manufacture of nitrogen peroxide. 8,992. March 29. (France, April 15, 1922.)
 Verein für Chemische und Metallurgische Produktion. Production of chemically-pure sulphuric acid. 8,956. March 29. (Germany, April 10, 1922.)

The Yellowing of Linseed Oil

ACCORDING to a paper recently published, linseed oil films do not yellow in darkness or in dry air, but only in the presence of moisture. This yellowing of linseed oil films is claimed to be due to linolenic acid produced by hydrolysis, owing to the action of moisture on the film. The evidence adduced for this statement is that, whereas films of free linolenic acid become yellow on drying, with subsequent softening of the film and development of a brown colouration, no such behaviour is found with films of linseed oil fatty acid.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, April 12, 1923.

BUSINESS is steadily recovering from the effects of the recent holidays and the volume of trade passing is increasing. The tone has been much brighter than last week. Prices generally still tend upward.

There is an active inquiry for export, and a fair business is reported.

General Chemicals

ACETONE remains a firm and active market. A substantial business is passing in all positions.

ACID ACETIC is very firm in price. Parcels arriving pass steadily into consumption.

ACID CITRIC is a dear market, and further improvement is anticipated.

ACID FORMIC is very scarce for early delivery, and little, if anything, is offering from abroad.

ACID LACTIC.—Unchanged.

ACID OXALIC is featureless, but stocks are firmly held.

ACID TARTARIC has advanced in price, and makers anticipate substantially higher values.

ARSENIC is in good demand. The price remains firm.

BARIUM CHLORIDE is a fair market, and the price is unchanged.

FORMALDEHYDE.—Buying is restricted to immediate requirements. Stocks are in strong hands, and the price is unchanged.

LEAD ACETATE.—The price of the acetate is gradually adjusting itself to the course of the metal, and is steadily climbing upward. The demand is only of very moderate proportions.

METHYL ALCOHOL is in slightly freer supply; price unchanged.

POTASSIUM CARBONATE remains a nominal market.

POTASSIUM PERMANGANATE is firm in price and very scarce.

POTASSIUM PRUSSATE.—The price tends upward and the demand is improving.

SODIUM ACETATE is very scarce and is again higher in price.

SODIUM BICHROMATE.—American makers have advanced their price.

SODIUM HYPOSULPHITE.—Unchanged.

SODIUM NITRITE has been in rather better demand, and the price is firm.

SODIUM PRUSSATE.—Export markets are gradually evincing more interest, but the actual turnover at the moment is unsatisfactory.

ZINC OXIDE is unchanged.

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID is very firm. The best brands are commanding higher prices.

BROMIDES have advanced, and should improve further in sympathy with the Continental situation, as German makers show little inclination to enter upon fresh transactions at previous rates. Considerable business is reported.

CHLORAL HYDRATE is steady, business being slow pending the introduction of the new Budget.

HEXAMINE continues in good demand, both for home trade and for export. The market, which is not too well supplied, has an upward tendency.

HYDROQUINONE is advancing steadily. Buying for the photographic season is now active, the forward price standing above that at which sales from stocks are being effected.

MILK SUGAR is steady. Imports are likely to be on a smaller scale, as the current export season in New Zealand is now closed.

PHENAZONE is firmer, with a fair demand.

PHENOLPHTHALEIN is in good request, and the price is somewhat firmer.

VANILLIN.—English makers are under-selling the Continental manufacturers and securing the bulk of the orders at the present time.

Coal Tar Intermediates

There is nothing special to report in regard to home trade, but the export market continues to be interesting, and the foreign inquiry is quite good.

ALPHA NAPHTHOL is very firm, with stocks short.

ALPHA NAPHTHYLAMINE has been a firm home trade, but is unchanged in price.

ANILINE OIL AND SALT.—Export inquiries in fair quantity have been received.

BENZALDEHYDE has been of export interest, and Continental deliveries appear extremely difficult.

BENZIDINE BASE is without special feature.

BETA NAPHTHOL.—Export orders have been booked.

DIMETHYLANILINE is firm.

MONO CHLOR BENZOL has been in demand on export account.

NAPHTHIONATE OF SODA.—Some small home trade.

PARA DI CHLOR BENZOL.—Export orders have been received.

"R" SALT.—Some home trade is in the market.

RESORCINE TECHNICAL.—A few orders have been booked.

XYLIDINE is steady.

Coal Tar Products

The market maintains its active tone for nearly all coal-tar products, and in some cases very high limits are being reached.

90 PER CENT BENZOL is steady at 1s. 7d. to 1s. 8d. per gal. on rails.

PURE BENZOL is also steady at about 2s. 1d. per gal. on rails in the North, and 2s. 4d. to 2s. 5d. per gal. in the South.

CREOSOTE OIL is firm at 9d. per gal. on rails in the Midlands and North, and 9½d. to 9¾d. per gal. in the South.

CRESYLIC ACID is rather better, and the pale quality, 97/99 per cent is worth about 2s. 1d. per gal. on rails, while the dark quality, 95/97 per cent., is worth about 1s. 10d. per gal.

SOLVENT NAPHTHA is still weak at 1s. 4d. per gal. on rails.

HEAVY NAPHTHA has little inquiry, and is worth about 1s. 3d. per gal. on rails.

NAPHTHALENES are in strong demand, the lower melting points being worth from £10 to £12 per ton, while hot-pressed is worth about £14 per ton.

PITCH.—The market is inactive in the absence of buying orders, and occasional parcels can be obtained at somewhat less than recent values. To-day's quotations are: London, 200s. to 205s., f.o.b.; East Coast, 195s. to 200s., f.o.b.

Sulphate of Ammonia

The position is unchanged. There is a somewhat better demand for export to the Colonies.

[Current Market Prices on following pages.]

Phosphates from the South Seas

THE British Phosphate Commission, which controls Nauru and Ocean Islands, the former German possessions in the Pacific mandated to Great Britain, Australia, and New Zealand, proposes to instal at Nauru a cantilever or gantry capable of loading a 7,000 or 8,000 ton vessel in twenty-four hours. The purpose of the proposed installation is to make loading operations as far as possible independent of the weather, which at present is not the case as vessels are loaded in the open off shore, says a *Times* correspondent in Melbourne.

Though the initial cost of the installation will be considerable, the savings effected by its successful operation will, it is believed, more than compensate for the outlay. A vessel carrying, say 8,000 tons, will be loaded and dispatched in twenty-four hours, instead of taking a week or more, as is often the case at present. Cheaper freights will therefore be procurable, and owing to the saving in labour more men will then become available for raising phosphate, and the yearly output, which at Nauru was 241,440 tons in 1921, should be considerably increased. If the system comes up to expectations at Nauru similar plant will be installed at Ocean Island.

Current Market Prices

General Chemicals

	Per	£	s.	d.	£	s.	d.	
Acetic anhydride.....	lb.	0	1	7	to	0	1	9
Acetone oil.....	ton	90	0	0	to	95	0	0
Acetone, pure.....	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99-100%.....	ton	69	0	0	to	70	0	0
Acetic, 80% pure.....	ton	48	0	0	to	50	0	0
Acetic, 40% pure.....	ton	25	0	0	to	26	0	0
Arsenic, liquid, 2000 s.g.....	ton	100	0	0	to	105	0	0
Boric, cryst.....	ton	55	0	0	to	60	0	0
Carbolic, cryst. 39-40%.....	lb.	0	1	8	to	0	1	9
Citric.....	lb.	0	1	10	to	0	1	10½
Formic, 80%.....	ton	52	10	0	to	53	0	0
Hydrofluoric.....	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.....	ton	41	0	0	to	43	0	0
Lactic, 60 vol.....	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.....	ton	27	0	0	to	28	0	0
Oxalic.....	lb.	0	0	6½	to	0	0	7
Phosphoric, 1.5.....	ton	40	0	0	to	42	0	0
Pyrogallol, cryst.....	lb.	0	5	9	to	0	6	0
Salicylic, Technical.....	lb.	0	1	9	to	0	2	0
Sulphuric, 92-93%.....	ton	6	0	0	to	7	0	0
Tannic, commercial.....	lb.	0	2	3	to	0	2	9
Tartaric.....	lb.	0	1	4	to	0	1	4½
Alum, lump.....	ton	12	10	0	to	13	0	0
Alum, chrome.....	ton	28	0	0	to	29	0	0
Alumino ferric.....	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14-15%.....	ton	8	10	0	to	9	0	0
Aluminium, sulphate, 17-18%.....	ton	10	10	0	to	11	0	0
Ammonia, anhydrous.....	lb.	0	1	6	to	0	1	8
Ammonia, .880.....	ton	32	0	0	to	34	0	0
Ammonia, .920.....	ton	22	0	0	to	24	0	0
Ammonia, carbonate.....	lb.	0	0	4	to	0	0	4½
Ammonia, chloride.....	ton	50	0	0	to	55	0	0
Ammonia, muriate (galvanisers).....	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure).....	ton	35	0	0	to	40	0	0
Ammonia, phosphate.....	ton	68	0	0	to	70	0	0
Ammonia, sulphocyanide, com'l, 90% lb.	0	1	1	to	0	1	3	
Amyl acetate.....	ton	175	0	0	to	185	0	0
Arsenic, white, powdered.....	ton	70	0	0	to	75	0	0
Barium, carbonate, Witherite.....	ton	5	0	0	to	6	0	0
Barium carbonate, Precip.....	ton	15	0	0	to	16	0	0
Barium, Chlorate.....	ton	65	0	0	to	70	0	0
Barium Chloride.....	ton	17	0	0	to	17	10	0
Nitrate.....	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry.....	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp.....	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%.....	lb.	0	1	0	to	0	1	1
Bleaching powder, 35-37%.....	ton	10	10	0	to	11	0	0
Borax crystals.....	ton	28	0	0	to	32	0	0
Calcium acetate, Brown.....	ton	11	10	0	to	12	0	0
Grey.....	ton	19	15	0	to	20	0	0
Calcium Carbide.....	ton	16	0	0	to	17	0	0
Chloride.....	ton	6	0	0	to	7	0	0
Carbon bisulphide.....	ton	35	0	0	to	40	0	0
Casein technical.....	ton	105	0	0	to	110	0	0
Cesium oxalate.....	lb.	0	3	0	to	0	3	6
Chromium acetate.....	lb.	0	1	1	to	0	1	3
Cobalt acetate.....	lb.	0	6	0	to	0	6	6
Oxide, black.....	lb.	0	9	6	to	0	10	0
Copper chloride.....	lb.	0	1	2	to	0	1	3
Sulphate.....	ton	27	0	0	to	28	0	0
Cream Tartar, 98-100%.....	ton	90	0	0	to	92	10	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde, 40% vol.....	ton	90	0	0	to	92	10	0
Formosol (Rongalite).....	lb.	0	2	2	to	0	2	3
Glauber salts, commercial.....	ton	5	0	0	to	5	10	0
Glycerin, crude.....	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.....	gal.	0	2	2	to	0	2	3
Iron perchloride.....	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas).....	ton	3	10	0	to	4	0	0
Lead acetate, white.....	ton	43	0	0	to	45	0	0
Carbonate (White Lead).....	ton	45	0	0	to	48	0	0
Nitrate.....	ton	44	10	0	to	45	0	0
Litharge.....	ton	45	0	0	to	46	0	0
Lithopone, 30%.....	ton	22	10	0	to	23	0	0
Magnesium chloride.....	ton	5	10	0	to	6	0	0
Carbonate, light.....	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts com- mercial).....	ton	6	10	0	to	7	0	0
Sulphate (Druggists).....	ton	10	0	0	to	11	0	0
Manganese Borate, commercial.....	ton	65	0	0	to	75	0	0
Sulphate.....	ton	58	0	0	to	60	0	0
Methyl acetone.....	ton	71	0	0	to	75	0	0
Alcohol, 1% acetone.....	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt.....	ton	41	0	0	to	42	0	0
Ammonium sulphate, double salt.....	ton	41	0	0	to	42	0	0

	Per	£	s.	d.	£	s.	d.	
Potash, Caustic.....	ton	33	0	0	to	34	0	0
Potassium bichromate.....	lb.	0	0	5½	to	0	0	6
Carbonate, 90%.....	ton	31	0	0	to	32	0	0
Chloride, 80%.....	ton	9	10	0	to	10	10	0
Chlorate.....	lb.	0	0	4½	to	0	0	4½
Metabisulphite, 50-52%.....	ton	84	0	0	to	90	0	0
Nitrate, refined.....	ton	43	0	0	to	45	0	0
Permanganate.....	lb.	0	0	10	to	0	0	10½
Prussiate, red.....	lb.	0	4	3	to	0	4	6
Prussiate, yellow.....	lb.	0	1	5½	to	0	1	6
Sulphate, 90%.....	ton	12	10	0	to	13	10	0
Sal ammoniac, firsts.....	cwt.	3	3	0	to	—		
Seconds.....	cwt.	3	0	0	to	—		
Sodium acetate.....	ton	24	15	0	to	25	0	0
Arsenate, 45%.....	ton	48	0	0	to	50	0	0
Bicarbonate.....	ton	10	10	0	to	11	0	0
Bichromate.....	lb.	0	0	4½	to	0	0	4½
Bisulphite 60-62%.....	ton	21	0	0	to	23	0	0
Chlorate.....	lb.	0	0	3½	to	0	0	3½
Caustic, 70%.....	ton	19	10	0	to	20	0	0
Caustic, 76%.....	ton	20	10	0	to	21	0	0
Hydrosulphite, powder.....	lb.	0	1	6	to	0	1	7
Hypo sulphite, commercial.....	ton	10	10	0	to	11	0	0
Nitrite, 96-98%.....	ton	28	0	0	to	29	0	0
Phosphate, crystal.....	ton	16	0	0	to	16	10	0
Perborate.....	lb.	0	0	11	to	0	0	11½
Prussiate.....	lb.	0	0	9½	to	0	0	9½
Sulphide, crystals.....	ton	10	10	0	to	11	0	0
Sulphide, solid, 60-62%.....	ton	16	10	0	to	17	10	0
Sulphite, cryst.....	ton	12	10	0	to	13	0	0
Strontium carbonate.....	ton	55	0	0	to	60	0	0
Strontium Nitrate.....	ton	40	0	0	to	42	0	0
Strontium Sulphate, white.....	ton	6	10	0	to	7	10	0
Sulphur chloride.....	ton	25	0	0	to	27	10	0
Sulphur, Flowers.....	ton	11	10	0	to	12	10	0
Roll.....	ton	11	0	0	to	12	0	0
Tartar emetic.....	lb.	0	1	3	to	0	1	4
Tin perchloride, 33%.....	lb.	0	1	2	to	0	1	4
Perchloride, solid.....	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals).....	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw.....	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%.....	ton	25	0	0	to	30	0	0
Oxide, 99%.....	ton	40	0	0	to	42	0	0
Dust, 90%.....	ton	45	0	0	to	47	10	0
Sulphate.....	ton	16	10	0	to	17	10	0

Pharmaceutical Chemicals

Acetyl salicylic acid.....	lb.	0	3	3	to	0	3	6
Acetanilid.....	lb.	0	1	6	to	0	1	9
Acid, Gallic, pure.....	lb.	0	3	0	to	0	3	3
Lactic, 1.21.....	lb.	0	2	9	to	0	3	0
Salicylic, B.P.....	lb.	0	2	2	to	0	2	6
Tannic, leviss.....	lb.	0	3	4	to	0	3	6
Amidol.....	lb.	0	8	6	to	0	8	9
Amidopyrin.....	lb.	0	13	3	to	0	13	6
Ammon ichthosulphonate.....	lb.	0	2	0	to	0	2	3
Barbitone.....	lb.	0	17	6	to	0	18	0
Beta naphthol resublimed.....	lb.	0	1	9	to	0	2	0
Bromide of ammonia.....	lb.	0	0	8½	to	0	0	9
Potash.....	lb.	0	0	8	to	0	0	8½
Soda.....	lb.	0	0	8½	to	0	0	9
Caffeine, pure.....	lb.	0	12	0	to	0	12	3
Calcium glycerophosphate.....	lb.	0	5	9	to	0	6	0
Calcium lactate.....	lb.	0	2	0	to	0	2	3
Calomel.....	lb.	0	4	9	to	0	5	0
Chloral hydrate.....	lb.	0	4	0	to	0	4	3
Cocaine alkaloid.....	oz.	0	18	0	to	0	18	6
Cocaine hydrochloride.....	oz.	0	14	9	to	0	15	0
Corrosive sublimate.....	lb.	0	4	3	to	0	4	6
Eucalyptus oil, B.P. (70-75% eucalyptol)								
lb.....	0	1	6	to	0	1	6½	
B.P. (75-80% eucalyptol).....	lb.	0	1	7	to	0	1	7½
Guaiacol carbonate.....	lb.	0	8	3	to	0	8	6
Liquid.....	lb.	0	9	6	to	0	10	0
Pure crystals.....	lb.	0	10	6	to	0	10	9
Hexamine.....	lb.	0	4	3	to	0	4	6
Hydroquinone.....	lb.	0	3	9	to	0	4	0
Lanoline anhydrous.....	lb.	0	0	7	to	0	0	7½
Lecithin ex ovo.....	lb.	0	18	6	to	0	1	0
Lithia carbonate.....	lb.	0	9	6	to	0	10	0
Methyl salicylate.....	lb.	0	2	6	to	0	2	9
Metol.....	lb.	0	9	6	to	0	10	0
Milk sugar.....	cwt.	4	15	0	to	5	0	0
Paraldehyde.....	lb.	0	1	6	to	0	1	9
Phenacetin.....	lb.	0	5	9	to	0	6	3
Phenazone.....	lb.	0	7	6	to	0	7	9
Phenolphthalein.....	lb.	0	5	3	to	0	5	6
Potassium sulpho guaiacolate.....	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.....	oz.	0	2	3	to	—		

	Per	£	s.	d.	to	£	s.	d.
Resorcine, medicinal	lb.	0	5	3	to	0	5	6
Salicylate of soda powder	lb.	0	2	6	to	0	2	9
Crystals	lb.	0	2	9	to	0	3	0
Salol	lb.	0	2	9	to	0	3	0
Soda Benzoate	lb.	0	2	3	to	0	2	6
Sulphonol	lb.	0	14	0	to	0	14	6
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	12	0	to	0	12	6
" soda salicylate	lb.	0	7	9	to	0	8	3
Vanillin	lb.	1	3	6	to	1	4	6

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	0	to	0	2	3
Alphanaphthol, refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	1	6	to	0	1	7
Aniline oil, drums extra	lb.	0	0	9½	to	0	0	10
Aniline salts	lb.	0	0	9½	to	0	0	10
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	0	to	0	3	3
Benzidine, base	lb.	0	5	0	to	0	5	3
Benzidine, sulphate	lb.	0	3	9	to	0	4	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorobenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorobenzol	lb.	0	0	11	to	0	0	12
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	7	to	0	1	9
Dimethylaniline	lb.	0	3	0	to	0	3	3
Diphenylamine	lb.	0	3	9	to	0	4	0
H-Acid	lb.	0	5	0	to	0	5	3
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorobenzol	lb.	0	0	10	to	0	0	11
Metaisic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (s. 7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	2	3	to	0	2	6
Naphthionate of Soda	lb.	0	2	6	to	0	2	9
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	8	to	0	0	8
Nitronaphthalene	lb.	0	1	0	to	0	1	1
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorobenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	0	to	0	8	0
Para-amidophenol, hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorobenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	9	to	0	6	3
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcine, technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	10	to	0	0	11
Tolidine, base	lb.	0	7	3	to	0	7	9
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

The market this week has been very quiet, with practically no business passing. There are no changes of any sort to report.

	ESSENTIAL OILS.	c.i.f.	1/10 spot	£	s.	d.
Anise				0	2	0
Bay				0	12	0
Bergamot	firmer and likely to go dearer			0	12	0
Cajuput				0	3	9
Camphor, white	per cwt.			4	0	0
Camphor, brown				3	15	0
Cassia	c.i.f. 7/9 spot			0	8	3
Cedarwood				0	1	6
Citronella (Ceylon)	easier, spot 3/2 afloat 3/- c.i.f.			0	2	11
Citronella (Java)	firmer, spot			0	4	0
Clove				0	7	6
Eucalyptus				0	1	6
Geranium Bourbon				1	8	0
Lavender	higher			0	12	0
Lavender spike				0	3	0
Lemon	firmer, likely to go higher			0	3	0
Lemongrass	per oz.			0	0	2½
Lime (distilled)	firmer, likely to go higher			0	3	3

Orange sweet (Sicilian)	firmer	£	s.	d.
Orange sweet (West Indian)		0	10	0
Palmarosa		0	9	0
Peppermint (American)		0	17	6
Mint (dementolised Japanese)		0	13	0
Patchouli		0	6	3
Otto of Rose	per oz.	1	12	0
Rosemary		1	4	0
Sandalwood		0	1	8
Sassafras		1	6	0
Thyme	according to quality 2/6 to	0	5	0
		0	8	0

SYNTHETICS.

SYNTHETICS.		
Benzyl acetate	0	3 0
Benzyl benzoate	0	3 0
Citral	0	10 0
Coumarine	dearer	0 15 0
Heliotropine	25	0 7 0
Ionone		1 5 0
Linalyl acetate		1 2 6
Methyl salicylate	very firm	0 2 6
Musk xylol		0 9 0
Terpeniol	very firm	0 3 0

United Alkali Co.

THE United Alkali Co.'s report for the period of two years ended December last, states that after transferring to debenture redemption account £15,000 in 1921 and £15,000 in 1922, and an amount of £76,991 to reserve, the certified balance-sheet shows a total at credit of profit and loss account on December 31, 1922, of £505,897. It is proposed to deal with the balance as follows:—Final dividend for 1922 on preference shares at the rate of 7 per cent. per annum, less income-tax, £74,162; dividend of 2s. per share on ordinary shares, less income-tax, £45,000; carrying forward to 1923 £386,735. During the period under review an alteration in the methods of manufacture at the North American Chemical Company's works has rendered a portion of its plant available for sale. This has been disposed of, providing a sum of £273,009 to credit, which has been placed direct to the reserve fund. The balance of profit and loss to credit includes a considerable sum which in former years had been reserved for war taxation, but which, now that final assessment to this duty can be more accurately determined, is available to return to profit and loss. The directors anticipate the settlement of the company's difficult and complicated war taxation questions is so near completion that henceforth it will be practicable to return to the regular presentation of accounts at the end of each twelve months' operations. The company's plant and machinery have been well maintained and all necessary repairs effected. An extraordinary general meeting of the shareholders is to be held upon conclusion of the annual general meeting, and if the resolutions to be proposed at the extraordinary general meetings of April 18 and May 3 be adopted, the sum of £300,000 part of the undivided surplus of £386,734 brought forward from 1922 will be capitalised and allotted to the ordinary shareholders whose names are upon the share register at April 17, 1923, in the form of fully-paid ordinary shares, in the proportion of one share for every two ordinary shares held by them on that date, thereby reducing the "carry forward" to £86,735. Resolutions will also be submitted at the extraordinary general meeting to increase the capital to £4,500,000 by the creation of 900,000 new ordinary shares of £1 each, and to split the 300,000 preference shares of £10 each into 3,000,000 shares of £1 each.

How Railway Companies Frighten Claimants

DURING the hearing of a claim with reference to damage done to goods in transit on the railway in the Shoreditch County Court, before Judge Cluer, the question of liability arose as to who should claim from the railway company—the consignees or consignors. Counsel, at great length, read from actions in the House of Lords, and finally Judge Cluer said: "These decisions do not impress me, as there is the recent case which was taken to the House of Lords by the railway company which they knew to be hopeless from the start. That is what they rely upon to frighten people not to bring actions. 'The case will be taken to the House of Lords' is the cry, and the poor sufferer will not go on with the action for fear of endless costly litigation. It is one way of frightening people out of court."

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, April 11th, 1923.

PROBABLY accounted for, to a certain extent, by the holidays, there has been a very quiet tone in the heavy chemical market during the past week.

German chemicals are still coming forward in limited quantities, and the prices asked for same remain very firm.

Industrial Chemicals

ACID ACETIC.—Glacial 98/100%, £65 to £69 per ton; 80% pure, £46 to £48 per ton; 80% technical, £45 to £47 per ton, c.i.f. U.K. ports.

ACID BORACIC.—Crystal or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K.

ACID CARBOLIC CRYSTALS.—Quoted 1s. 8d. per lb., but little on offer.

ACID CITRIC (B.P. CRYSTALS).—Unchanged at 1s. 7d. per lb., spot delivery.

ACID FORMIC 80%.—Price about £53 to £54 per ton.

ACID HYDROCHLORIC.—Maker's price unchanged, 6s. 6d. per carboy, ex works.

ACID NITRIC 84%.—£27 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Inclined to be easier. Obtainable at 6½d. per lb.

ACID SULPHURIC 144°.—£3 15s. per ton; 168°, £7 per ton, ex works, full loads. Dearsenicated quality, £1 per ton extra.

ACID TARTARIC.—Moderate inquiry. About 1s. 2½d. per lb.

ALUM, LUMP POTASH.—Offered at £12 10s. per ton, ex store.

AMMONIA, ANHYDROUS.—Unchanged at 1s. 6d. per lb., ex station.

AMMONIA CARBONATE.—Good export inquiry. Lump, 4d. per lb.; ground, 4½d. per lb., delivered.

AMMONIA MURIATE.—Grey galvanisers quality, about £32 per ton, f.o.r. works.

AMMONIA SALAMMONIAC.—98/100% fine white crystals offered from Continent at £26 per ton, c.i.f. U.K.

AMMONIA SULPHATE.—25¼%, £15 10s. per ton; 25½%, neutral quality, £16 13s. per ton, ex works, April-May.

ARSENIC, WHITE POWDERED.—Inclined to be easier at about £76 per ton, ex store.

BARIUM CHLORIDE.—98/100% offered at £18 10s. per ton, ex store, spot delivery. Continental offers of £15 per ton, c.i.f. U.K.

BARYTES.—Fine white English £5 5s. per ton, ex works.

BLEACHING POWDER.—£11 10s. per ton, ex station, spot. Contracts 20s. per ton less. Offered from Continent at £9 per ton, c.i.f. U.K.

BORAX.—Crystal or granulated £28 per ton; powdered £29 per ton, carriage paid U.K.

CALCIUM CHLORIDE.—English make £5 15s. per ton, ex quay or station.

COPPERAS, GREEN.—Unchanged at £2 15s. per ton, f.o.b. U.K.

FORMALDEHYDE, 40%.—Offered at £88 per ton, ex wharf, early delivery.

GLAUBER SALTS.—Fine white crystals £4 per ton, ex store.

LEAD, RED.—English make £43 per ton, carriage paid U.K. Continental make about £37 per ton, ex store.

LEAD ACETATE.—White crystals £38 10s. per ton, ex store, spot delivery; brown about £36 10s. per ton.

MAGNESITE, GROUND CALCINED.—Unchanged at £8 10s. per ton, ex station.

MAGNESIUM CHLORIDE.—Spot lots about £5 per ton, ex store. Offered from Continent at £3 7s. 6d. per ton, c.i.f. U.K. prompt.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial crystals £7 per ton; B.P. crystals £8 10s. per ton, delivered; Commercial offered at £2 per ton, f.o.b. Hamburg for British Colonies.

POTASSIUM BICHROMATE.—Unchanged at 5½d. per lb., delivered.

POTASSIUM CARBONATE.—96/98% about £33 per ton, 90/92% £29 per ton, ex store, spot delivery.

POTASSIUM CAUSTIC, 88/92%.—Spot lots hard to obtain. Quoted £35 per ton, ex store.

POTASSIUM CHLORIDE.—In little demand, crystal or powder 3d. per lb., ex store.

POTASSIUM MURIATE.—Quoted £9 per ton, basis 80%, f.o.r. works.

POTASSIUM NITRATE (SALTPETRE).—Unchanged at about £32 per ton, ex store.

POTASSIUM PERMANGANATE.—B.P. crystals now 10½d. per lb., spot, but little on offer.

POTASSIUM PRUSSATE (YELLOW).—Inclined to be higher at 1s. 5½d. per lb.

POTASSIUM SULPHATE.—Quoted £7 5s. per ton, basis 80% f.o.r. works.

SODIUM ACETATE.—Small parcels on offer at £25 per ton, ex store.

SODIUM BICARBONATE.—Refined Recrystallised £10 10s. per ton, ex quay or station. Mineral water quality, £1 10s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4½d. per lb. delivered.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. (Alkali, 58%), £8 17s. 6d. per ton, ex quay or station.

SODIUM CAUSTIC, 76/77%, £21 10s. per ton; 70/72%, £20 per ton; 60/62%, broken, £21 5s. per ton; 98/99%, powdered, £24 17s. 6d. per ton, ex station, spot delivery.

SODIUM CHLORATE.—Price about 3d. per lb., ex store. Offered from Continent at 2½d. per lb., c.i.f. U.K.

SODIUM HYPOSULPHITE.—Commercial quality, £10 10s. per ton; pea crystals, £15 10s. per ton, ex station; commercial crystals offered from Continent at £9 15s. per ton, c.i.f. U.K.

SODIUM NITRATE, 96/98%.—Refined quality unchanged at £13 10s. per ton, f.o.r. or f.o.b. U.K.

SODIUM NITRITE, 100%.—£27 to £29 per ton, according to quantity.

SODIUM PRUSSATE (YELLOW).—Offered at 9d. per lb., ex store, spot delivery.

SODIUM SULPHATE (SALTCAKE 95%).—Price for home consumption £4 per ton, carriage paid station, on contract.

SODIUM SULPHIDE, 60/62% CONC.—British material offered at £15 15s. per ton, f.o.b. U.K. Continental about £15 10s. per ton, c.i.f.

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £8 per ton; ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.

ZINC CHLORIDE, 98%.—Solid English material, £25 per ton, f.o.b. U.K. port.

ZINC SULPHATE.—Quoted £14 10s. per ton, ex station.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels

Coal Tar Intermediates and Wood Distillation Products

AMIDO NAPHTHOL SULPHONIC ACID, 1:2:4.—Some inquiry. Price 4s. per lb., 100 per cent. basis, carriage paid.

ANTHRANILIC ACID.—In fairly good demand. Price quoted, 10s. per lb., 100 per cent. basis.

BENZIDINE BASE.—Demand only moderate. Price 6s. 6d. per lb., 100 per cent. basis.

BETA NAPHTHOL.—Good inquiry. Price remained firm at 1s. 1d. per lb. delivered.

BETA NAPHTHYLAMINE.—Some home inquiries. Price 4s. per lb. delivered.

BETA OXY NAPHTHOIC ACID.—Some small inquiries. Price 10s. per lb. delivered.

CHROMOTROPIC ACID.—Some home inquiries. Price 10s. 6d. per lb., 100 per cent. basis.

DINITROCHLOROBENZOL.—Fair inquiries. Price quoted, £95 per ton delivered.

"G" SALT.—Small home demand. Price 3s. 3d. per lb., 100 per cent. basis.

GAMMA ACID.—Some inquiry for export. Price 13s. 9d. per lb., 100 per cent. basis, f.o.b.

"H" ACID.—Good demand for home trade. Price remains firm at 5s. per lb. on 100 per cent. basis.

METAPHENYLENEDIAMINE.—Export inquiry. Price quoted, 5s. 6d. per lb., 100 per cent. basis.
NEVILLE & WINTHER ACID.—Export inquiry. Price quoted, 6s. per lb., 100 per cent. basis, f.o.b.
PARA AMIDO SALICYLIC ACID.—Export inquiry. Price 7s. 6d. per lb., 100 per cent. basis, f.o.b.
PARAPHENYLENEDIAMINE.—Export inquiry. Price quoted, 12s. 6d. per lb., 100 per cent. basis, f.o.b.
SULPHANILIC ACID.—Export inquiry. Price 1s. 5d. per lb., 100 per cent. basis, f.o.b.

Manchester Chemical Market

[FROM OUR OWN CORRESPONDENT.]

Manchester, April 12, 1923.

WHILST the chemical market here has produced no new features during the past week, a quietly steady demand for quite a number of the leading lines, both on home consumption account and for shipment, can be reported. Supplies of many products are not excessive, and in some cases there is real difficulty in getting hold of prompt or early parcels. Prices, therefore, are firmly held practically all round. Brunner-Mond, United Alkali and Salt Union shares are still attracting close attention on the Stock Exchange.

Heavy Chemicals

Caustic soda continues to find a ready sale, both among home consumers and for export, at from £19 per ton for 60 per cent. strength to £21 10s. for 76-77 per cent. A good home and foreign demand for bleaching powder is also being met with, and prices are very firm at £11 10s. per ton to home users. Soda crystals keep steady at £5 5s. per ton delivered, but business is on the quiet side. Saltcake is in steady request at £4 10s. to home consumers and £5 per ton for export. Sodium sulphide, 60 to 65 per cent. concentrated, is still a dull section, though prices are unchanged at £15 per ton, crystals being quoted at £9. Glauber salts are firm at £4 per ton, but little business is being done. Bi-carbonate of soda is steady and in fair demand at £10 10s. per ton delivered to home users. Alkali is being steadily called for by home consumers and also for shipment; prices are firm at £7 12s. 6d. per ton for the home trade for 58 per cent. material. Hyposulphite of soda is still inactive at £15 10s. per ton for photographic crystals and £10 for commercial. Nitrite of soda is steady at £26 10s. per ton, but the demand is only on a small scale. Phosphate of soda is quiet but unchanged at £15 per ton. Chlorate of soda is steady and in fair demand at 3d. per lb. Prussiate of soda is rather weak at 9d. per lb., with only restricted business being done. Bichromate of soda is fairly active at 4½d. per lb. Acetate of soda continues in short supply, and prices are firmly maintained at £25 per ton.

Caustic potash is in steady demand, and prices are firmer at £34 per ton for 88-90 per cent. Carbonate of potash is again dearer at £32 10s. per ton for 96-98 per cent. material. Bichromate of potash is steady and in fairly active inquiry at 5½d. per lb. Yellow prussiate of potash is quiet but unchanged at 1s. 5½d. per lb. Chlorate of potash is firm at 3½d. per lb. and meets with a rather good demand. Permanganate of potash is unchanged in position or value at 9½ to 9¾d. per lb.

Among miscellaneous chemicals sulphate of copper is only moderately active for export at £26 10s. per ton. There is still a scarcity of arsenic for early shipment and supplies are readily taken up; prices are firm and about unchanged at £75 per ton for white powdered, Cornish makes. Commercial Epsom salts are rather quiet but firm at £6 10s. for British and about £5 per ton for foreign makes; magnesium sulphate, B.P., is quoted at about £7. Acetate of lime is in short supply, and prices are strong at about £20 for grey and £10 10s. per ton for brown. Nitrate of lead is firm but rather inactive at £43 10s. per ton. White sugar of lead is quoted at £40 to £41 per ton, with brown at about £38.

Acids and Tar Products

There has been an improvement in the demand for both tartaric and citric acids. Tartaric is quoted at 1s. 2½d. to 1s. 3d. and citric, B.P. crystals, at 1s. 8d. per lb. Acetic acid is also an active section at about £70 for glacial and £47 per ton for 80 per cent. technical. Oxalic acid keeps very quiet at 6½d. per lb.

Pitch is being actively inquired for shipment but supplies are still scarce, and the price is nominally £9 10s. per ton, f.o.b.

Manchester. Carbolic acid crystals are in steady demand from overseas buyers, and prices are steady at 1s. 8d. per lb.; crude, 60 per cent., being quoted at 3s. 6d. to 4s. per gallon. Benzol is unchanged at 1s. 8d. per gallon. Solvent naphtha is only in moderate inquiry at 1s. 8d. to 1s. 9d. per gallon. Crescote oil keeps very firm and in good demand at 10½d. per gallon. Naphthalenes are finding a more active market; refined is firmer at £19 to £20 per ton, crude being quoted at £6 to £11 according to grade.

Proprietary Trade Names

Action in the Chancery Division

TAYLOR'S DRUG CO., LTD., Burley Hill, Leeds, and the Veno Drug Co., of Chester Road, Manchester, were the parties in an action on Tuesday in the Chancery Division before Mr. Justice Eve. The dispute circled around the use of the names Germoce, Germolene, and Homocea for patent ointments, and was a motion by the Taylor Co. asking the Court to reverse a refusal by the Registrar of Trade Marks to register the name Germoce. The motion was opposed by the Veno Co., the owners of Germolene, on the ground that that name was similar to Germoce.

Mr. Hunter Gray, K.C., for the applicants, said the Registrar refused to register the proposed name not because it resembled Germolene but because it was composed partly of that name and partly of Homocea, and therefore was likely to cause confusion. The owners of Homocea did not oppose, though it was stated that they would have done so had their attention been drawn to the matter. It was entirely a new principle for the Registrar to adopt to bring in a third name before deciding that confusion would be caused, and counsel submitted that Germoce would never be confused with either of the other names. The prefix "Germ" was in common use, and he claimed that the applicants were entitled to take the first half of one name and the second of another to make a new combination which was not like either.

Sir Duncan Kirby, K.C., for the opponents, said there was a distinct risk of confusion between these names. There was no need for Taylor's to adopt such a name and their object in doing so evidently was to get the benefit of the reputation of Germolene and Homocea.

Judgment was reserved.

Applications for Dyestuffs Licenses in March

THE following statement relating to applications for licenses under the Dyestuffs Act, made during the month of March, has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee:—

The total number of applications received during the month was 539, of which 459 were from merchants and dealers. To these should be added the 30 applications outstanding on March 1, making a total for the month of 569. These were dealt with as follows:—

Granted—405 (of which 376 were dealt with within 7 days of receipt).

Referred to British makers of similar products—105 (of which 96 were dealt with within 7 days of receipt).

Referred to Reparation supplies available—37 (all of which were dealt with within 2 days of receipt).

Outstanding on March 31—22 (mostly received immediately prior to Easter).

Of the total number, 569, of applications received, 467, or 82 per cent., were dealt with within four days of receipt.

Catalogues Received

FIRTH, BLAKELEY, SONS AND CO., LTD.—"What we make" is the title of a booklet issued by this firm from their offices at 15, Park Row, Leeds. It consists of some 20 pages of illustrations showing their works and specialities, such as fuel storage tanks, benzol and ammonia scrubbers, gasholders and purifiers erected at various works throughout the country.

SELBY ENGINEERING CO., LTD.—A small folder has been issued by this firm giving information about their new product "Navaline Lacpaint," which is a quick drying enamel which they state will dry in four hours without cracking, thus saving time for manufacturers, shipowners, etc., in repainting their plant. It may be supplied in any colour, and is suitable for indoor or outdoor use. Full particulars may be obtained on application to 92, Fenchurch Street, London, E.C.3.

Company News

NOBEL INDUSTRIES, LTD.—The transfer books for the 8 per cent. seven-year secured notes will be closed from April 17 to April 30, both dates inclusive.

CANADIAN EXPLOSIVES, LTD.—A dividend of 1½ per cent. has been declared for the quarter ended March 31, on the 7 per cent. cum. preferred shares, payable on April 16.

FORSTER'S GLASS CO., LTD.—The directors announce that the profits for the past year will not warrant them paying any dividend on the preference shares for the present. The preference dividend due March 31, 1922, was deferred, and a net deficit of £31,579 was carried forward, exclusive of any depreciation.

ALIANZA CO., LTD.—Cable advices from Valparaiso state that the gross profit for the year 1922 was £205,000 and the net profit £153,000. The local board recommend a final dividend of 20s. per share (20 per cent.), making a total dividend for the year of 40 per cent., leaving a balance of £447,000 to be carried forward. Meeting, Calle Prat 268, Valparaiso, Chile, on June 12, at 3 p.m.

AGUAS BLANCAS NITRATE CO.—The net profit for 1922, after providing £5,500 for taxes and placing £5,000 to reserve, amounted to £26,712, against £35,374 for 1921. The amount brought forward was £39,179, giving a total surplus of £65,891. A final dividend is recommended of 50 per cent., less tax, making 75 per cent. for the year, while the balance carried forward is £27,142.

BORAX CONSOLIDATED, LTD.—A dividend has been declared at the rate of 6 per cent. per annum, less income tax at 5s. in the £, on the preferred ordinary shares, in respect of the half-year ending March 31. Coupon No. 31 of the preferred ordinary share warrants to bearer will be paid, less income tax, on and after May 1, at the offices of the company. The transfer books will be closed from April 20 to April 30, both days inclusive.

BRITISH BROKEN HILL PROPRIETARY CO., LTD.—At an extraordinary general meeting, held at Winchester House on Wednesday, Mr. E. E. Garner, of 27, Old Broad Street, was appointed liquidator for the purpose of winding up the company, and was directed to carry into effect the agreement, dated March 16, 1923, for the sale of the company's property and assets to the British Australian Broken Hill, Ltd. (Incorporated in South Australia).

THARSIS SULPHUR AND COPPER CO., LTD.—The net profit for 1922, including £73,101 brought forward, was £144,380. The directors recommend the payment of a dividend of 5s. per share, equal to 12½ per cent. on the capital of the company, less tax, leaving £29,145 to carry forward. The annual general meeting will be held at 136, West George Street, Glasgow, on Wednesday, April 18, at 12 o'clock noon. The transfer books are closed until April 19.

MASON AND BARRY, LTD.—The profit for 1922, after payment of all expenses, amounts to £77,652, which, with £33,776 brought in, makes a total of £111,428. The directors propose a dividend of 37½ per cent., or 7s. 6d. per share, less tax at 5s. 3d. in the £, payable on April 26. The sum of £5,000 has been added to the staff pension fund, and £36,988 is carried forward, subject to corporation profits tax. Meeting at Cannon Street Hotel, London, on April 16, at 2 p.m.

UNITED ALKALI CO., LTD.—The report for the period of two years ended December last, states that after transferring £30,000 to debenture redemption fund, and £76,991 to reserve, there is a credit balance of £505,897. It is proposed to pay a dividend of 2s. per share on the ordinary shares, less tax, and to increase the capital to £4,500,000 by the creation of 900,000 ordinary £1 shares. The annual meeting will be held at 14, Cook Street, Liverpool, on April 18, at 2 p.m.

BEDE METAL AND CHEMICAL CO.—The directors regret that, owing to continual depression in the copper, iron and steel trades, they are again obliged to report a loss on the operations for 1922, of £13,520, to which must be added a debit balance brought in of £42,662, making a total of £56,182. A sum of £27,000 has been written off the reserve fund, leaving £29,182 at debit of profit and loss account. The annual meeting will be held at the Central Station Hotel, Newcastle-on-Tyne, on April 18, at 2.30 p.m.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. No.
Albania	Paints and varnishes	
Warsaw	Chemicals and drugs, aluminium, etc.	
Stockholm ..	Surgical dressings	
Basle.....	Light and heavy chemicals, pharmaceuticals, chemical raw products, resins, oils, etc.	
Washington .	Calcium arsenate.....	D.O.T. 5411/C./T.C./C.C./2.
Rio de Janeiro ...	Soap and perfumery	

Tariff Changes

SPAIN.—The following goods on importation now require certificates of origin: Glassware, except hollow glass; industrial stoneware; platinum and silver in all forms; alloys of lead, tin, zinc, antimony, bismuth and purpurin of copper; scientific apparatus; nitrated and chlorated derivatives of coal; paranitraniline; diphenylamine; alpha and beta naphthol; anthraquinone; sulphate of magnesia; salts of natural mineral waters; peroxide of hydrogen; "perhidrol" and the like; phosphatic manures and basic slag; chloroform, chloral and methyl chloride; ethers and esters; drugs (caffeine, quinine, morphine, cocaine, etc.); metol; hydroquinone; pyrogallol acid; pyrocatechin; phenol compounds for photography; salicylic acid and various salicylates; thymol and vanilline; eucalyptol, menthol and the like; silver salts; pure and pharmaceutical chemical products, not specially mentioned.

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

SWINDON (April 28).—Disinfectants and chemicals. Particulars from S. C. Baggott, borough surveyor, 34, Regent Circus, Swindon.

EDINBURGH (April 30).—Oils, paints, explosives. Tenders received by A. G. G. Asher, W.S., County Buildings, Edinburgh.

GLASGOW (April 23).—Drysalteries, oils, soaps, paints and varnishes, lime and cement. Particulars from R. B. Mitchell, 75, Waterloo Street, Glasgow.

The Swiss Dye Industry

THE crisis which set in in 1920 in the Swiss aniline industry has not yet abated. Under the circumstances, the greater part of the year 1922 was extremely depressing from a business point of view. A slight improvement has, of late, been perceptible, particularly in the trade with the United Kingdom and France. Nevertheless, great hopes cannot be entertained as regards the future. Business has entirely changed since pre-war days. The attempts which have been made to establish dye works in various countries have succeeded in the case of the United Kingdom, America and France, and in these countries a severe home competition has to be met with, which in pre-war days hardly existed.

Recent Wills

Mr. Frederick Thomas Hunt, J.P., Highfield, Castleford, Yorks, late of Messrs. Hunt Brothers and the Aire and Calder Chemical Works £123,776

THE BRITISH ALIZARINE COMPANY LTD.

Manchester

London

Glasgow

Manufacturers of Alizarine Dyestuffs

ALIZARINE RED
(all shades)

ALIZARINE BORDEAUX

ALIZARINE GREEN
(soluble and insoluble)

ALIZARINE RED S. POWDER

ALIZARINE (MADDER) LAKES
(of all qualities)

ALIZUROL GREEN
(Viridine)

ALIZANTHRENE BLUE

ALIZARINE BLUES
(soluble and insoluble)

ALIZARINE CYANINE

ALIZARINE ORANGE

ALIZARINE BLUE BLACK

ALIZARINE MAROON

ANTHRACENE BROWN

ALIZANTHRENE BROWN

ALIZANTHRENE YELLOW

Other fast colours of this series in course of preparation

Anthraquinone, Silver Salt and all intermediates of this series

CHROME TANNING and other Chrome Compounds

TELEPHONES
663 Trafford Park, MANCHESTER
808 EAST LONDON
3007 DOUGLAS, GLASGOW

TELEGRAMS:
BRITALIZ MANCHESTER
BRITALIZ LONDON
BRITALIZ GLASGOW

All communications should be
addressed to

The British Alizarine Co., Ltd.
Trafford Park, Manchester

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Receivership

MAGADI SODA CO., LTD. (R., 14/4/23.) A. W. Tait, of Basildon House, Moorgate, E.C., was appointed receiver and manager of the company's property (except uncalled capital), by Order of Court dated March 2, 1923, at the instance of the Trust Union, Ltd., on behalf of themselves and all other holders of the 6 per cent. convertible registered debentures issued by the company.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the Liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

AIRTON (WILLIAM), AND CO., LTD., Doncaster, chemists. (M., 14/4/23.) Registered March 28, £500 debentures; general charge.

BENTLEY (J. E.), AND CO., LTD., Halifax, bleachers, etc. (M., 14/4/23.) Registered March 26, £4,000 (not ex.) equitable mortgage, to bank; charged on part of Fernhill Estate, Warley, Halifax. *Nil. June 9, 1922.

CATALYTIC CHEMICAL CO., LTD., Southall. (M., 14/4/23.) Registered March 29, £1,500 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £1,000; general charge. *£9,600. January 13, 1923.

CLARENDON CHEMICAL CO., LTD., London, E.C. (M., 14/4/23.) Registered March 26, £150 debenture, to S. Chesterfield, Grafton Hotel, Tottenham Court Road, W., motor engineer; general charge.

GUILDFORD SANITARY LAUNDRY AND DRY CLEANING WORKS, LTD. (M., 14/4/23.) Registered March 27, Land Registry charge, to bank; charged on 6 and 7, Queen's Road, Guildford. *Nil. November 30, 1922.

PRICE AND SONS, LTD., London, W., enamel manufacturers. (M., 14/4/23.) Registered March 26, £600 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £300; general charge. *Nil. November 30, 1922.

SCHOLES (JOHN R.) AND CO., LTD., Manchester, chemical merchants, etc. (M., 14/4/23.) Registered March 26, £500 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £400; general charge.

London Gazette

Bankruptcy Information

HUNTER, Archibald Duncan, 28, Vereker Road, West Kensington, London, analytical chemist. (R.O., 14/4/23.) Receiving order, March 28. Creditor's petition. First meeting, April 18, 2.30 p.m., and public examination, July 13, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Partnership Dissolved

TATTERSALL AND RICHARDS (Joseph TATTERSALL and Arthur RICHARDS), dyers, Perseverance Mills, Shipley, in the county of York, by mutual consent as from March 29, 1923. Debts received and paid by J. Tattersall.

Tarnish on Silver

AN investigation by the United States Bureau of Standards has shown that the tarnish ordinarily observed on silver is the sulphide film, of which certain colours are characteristic and indicative of the extent of the tarnish. The effect of hydrogen sulphide gas by itself on silver is relatively small, but if small amounts of moisture and sulphur dioxide are present, the action is greatly accelerated. Tarnishing is also made more rapid by the presence of alkaline films and soap films.

New Companies Registered

BLACKBURN BROTHERS, LTD., Asquith Bottom Dye-works, Sowerby Bridge. Dyers, finishers and bleachers, makers of vitriol, bleaching and dyeing materials, etc. Nominal capital, £15,000 in £1 shares.

CANNING TOWN GLASS WORKS, LTD., manufacturers, importers and exporters of glass and glassware of all kinds. Nominal capital, £50,000 in £1 shares. A subscriber: E. H. Wiseman, "Morea," Severn Avenue, Gidea Park, Essex.

CROSS BONE MANURE AND LIME CO., LTD., The Electric Bone Mills, Pinfold Lane, Bridlington. Manufacturers of and dealers in bones, bone manures, superphosphates, lime and chalk chemicals, glue, sulphuric and other acids, greases, fats, oils, etc. Nominal capital, £50,000 in £1 shares.

EXPRESS DYEING AND CLEANING CO., LTD., Express Works, Northfield Road, Ealing. Dyers, bleachers, etc. Nominal capital, £5,000 in £1 shares.

FIRELIGHTERS (CHESTERFIELD), LTD., Hadfield Town, Chesterfield. Dealers in creosote, oils, greases, naphthalene, paint, tar, varnishes, etc. Nominal capital, £1,000 in 10s. shares.

J. HARRISON AND CO. (LIVERPOOL), LTD., Cunard Building, Liverpool. Manufacturers, importers and exporters of and dealers in oilcake, margarine, soap, candles, glycerine, manures, fertilisers, drugs, chemicals, etc. Nominal capital, £10,000 in £1 shares.

LAMINA, LTD., 65, Bishopsgate, London, E.C. Manufacturers of and dealers in manures and fertilisers. Nominal capital, £30,000 in 25,000 10 per cent. cumulative preference shares of £1 each, and 100,000 ordinary shares of 1s. each.

REMEDIES, LTD., 32, Welford Road, Leicester. Chemical manufacturers and dealers, drysalts, etc. Nominal capital, £500 in £1 shares.

SOSPIRO OILFIELDS, LTD., 428, Salisbury House, London Wall, E.C.2. Producers, refiners, etc., of petroleum and other oils, kerosene, petrol, natural gas, hydrocarbons, etc. Nominal capital, £1,365,000 in 1,300,000 8 per cent. non-cumulative preference shares of £1 each, and 1,300,000 ordinary shares of 1s. each.

C. M. SWITHINBANK AND SON, LTD., 28, Dock Street, Leeds. Drysalts, spice merchants, etc. Nominal capital, £6,000 in £1 shares (100 ordinary and 5,900 6 per cent. preference).

The Purity of Bottled Chemicals

THE discovery that a dry substance can absorb lead and arsenic from a glass bottle was successfully put forward as a defence by Boots Cash Chemists (Western) Ltd., at the Birmingham Police Court last week, in which the firm were summoned for selling at one of their shops a quarter of a pound of potassium carbonate not of the quality demanded by the British Pharmacopœia which contained about 80 parts of lead per 1,000,000 and about 10 parts of arsenic per 1,000,000. Mr. Bramall, of London, for the defence, said that there was only one hundred thousandth part of arsenic in the carbonate, which was not enough to hurt a fly. When the carbonate left Nottingham it was absolutely pure. Then it was put into a bottle. The conclusion was that the lead and arsenic were derived from the bottle. Experiments had been made confirming this, which was a new discovery. Every one of these bottles was being withdrawn from the shops, and being replaced by new bottles of clouded glass which contained neither lead nor arsenic.

What a "Chemical Age" Advertisement did

THE head of a British manufacturing company writes under date April 9, 1923:—

"I would take this opportunity of expressing my appreciation of results accrued from the advertisement I have lately placed in your paper. The results have well repaid the outlay, the colonial and foreign business being particularly good, new customers having been made in Australia, New Zealand, India, West Indies, Italy, France, South Africa, Roumania and other parts, all directly referring to the advertisement in THE CHEMICAL AGE."

